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LARGE MACHINE WORK at the PUGET SOUND NAVY YARD

By Fred H. Colvin
EDITOR-AMERICAN MACHINIST

THE set of cylinders shown in Fig. 1 are for an 1,800-hp. triple expansion engine. The extreme width of the cylinders is 88 in., the extreme height 5 ft. 8¾ in. and the total length 19 ft. 8 in., the finished weight being 38,200 lb. This view shows the method of clamping and also the use of braces as at *A* to take the thrust of the cutting tool. The other side of the job is shown in the headpiece, which indicates clearly the capacity of the planer necessary.

An interesting feature of this job is the fact that the planer was reconstructed in the navy yard and enlarged from a 72-in. x 12-ft. capacity to 120 in. x 18 ft., as it is at present. A better idea of the planer itself can be had from Fig. 2, where the engine base is being planed, both for the pillow block caps and on the side. This view shows the widened housing at the left and gives a good idea of its capacity. Fig. 3 shows the bedplate to better advantage. Boring the cylinders is shown in Fig. 4. The cylinders are first mounted on their uprights, which raise them a sufficient distance from the floor to enable the boring-bar housings to be fastened to the lower side. This gives room for the boring bar to pass through the cylinder, as it is fed down from the top.

THE BORING RIGS

Two boring rigs are used at once, as can be seen, the smaller bar in the foreground being driven from the motor *A*, which belts on to the pulley *B*. In a similar manner the motor *C*, which is largely hidden behind the first boring bar, drives the other boring bar by means of the pulley *D*. It is interesting to note how the driving heads of the boring bars are supported in position by means of the distance pieces or thimbles shown at *E*, *F* and *G*. Bolts running through these thimbles screw into the stud holes for the cylinder or valve chamber heads and hold the boring equipment rigidly in position.

Similar methods are used on the lower end. The

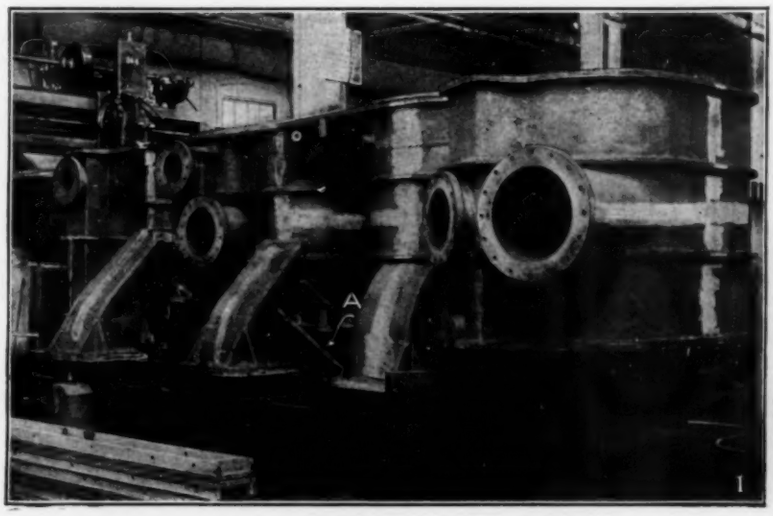


FIG. 1. PLANING TRIPLE EXPANSION CYLINDERS

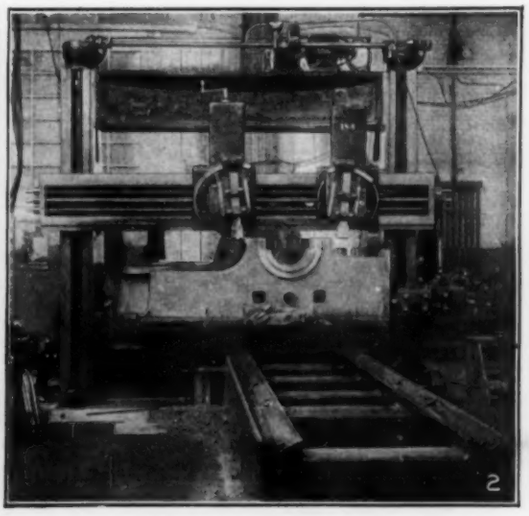


FIG. 2. PLANING THE ENGINE BASE

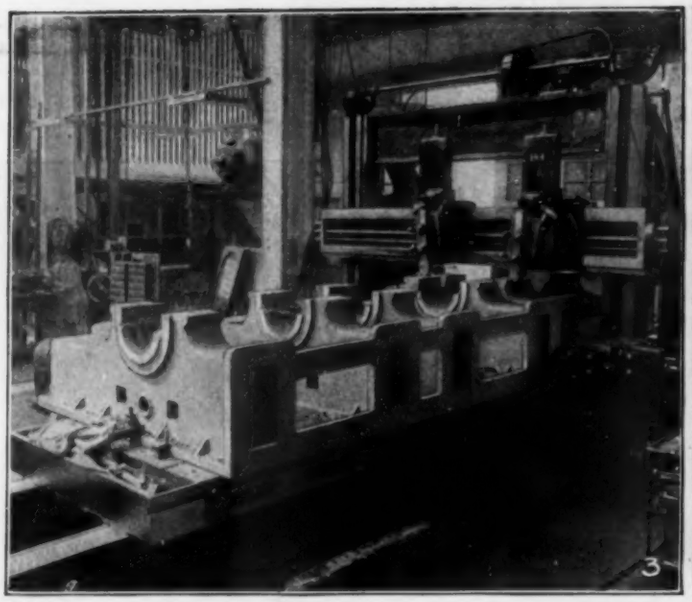


FIG. 3. PLANING THE PILLOW BLOCKS IN THE BASE

FIG. 4. BORING THE CYLINDERS

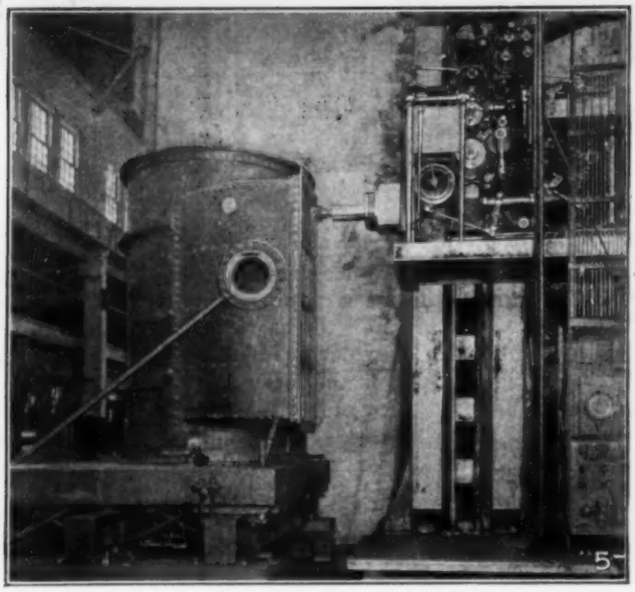


FIG. 5. MILLING EXHAUST INLET FOR CONDENSERS

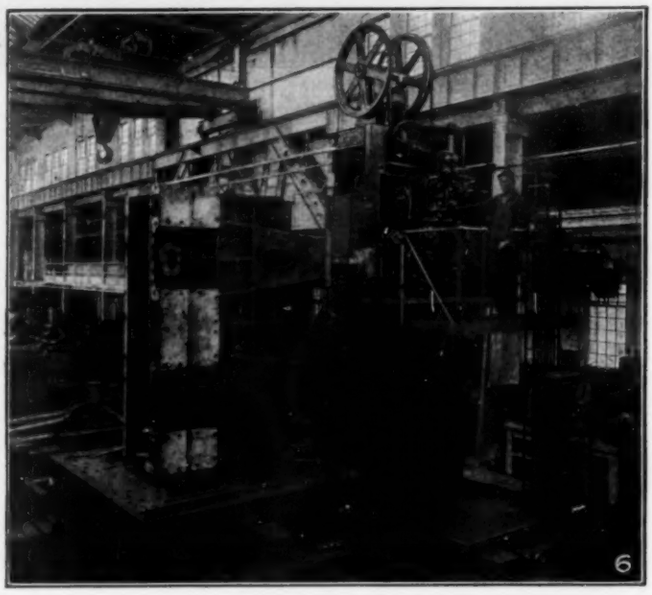


FIG. 6. MILLING COLUMN SEATINGS FOR CONDENSERS

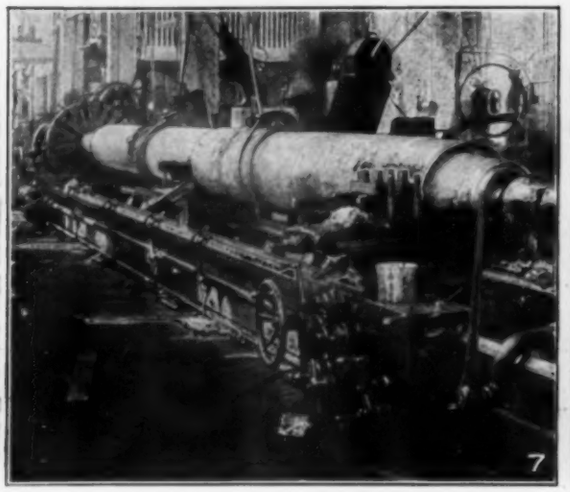


FIG. 7. ROUGH-TURNING A LARGE BENDING ROLL

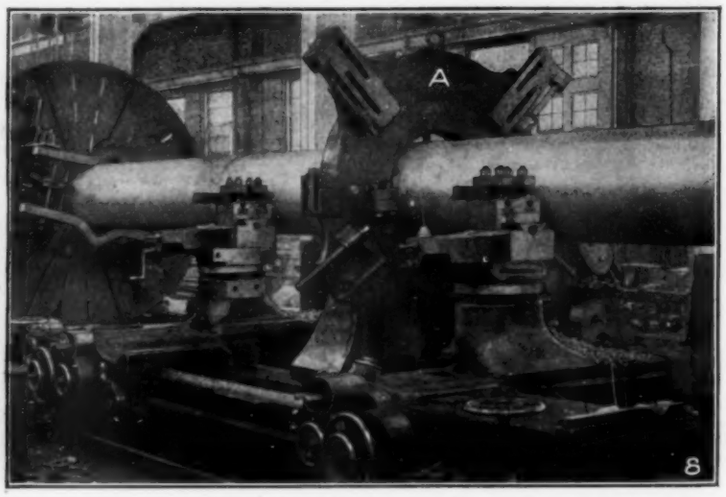


FIG. 8. THE BENDING ROLL IN THE FINISHING LATHE

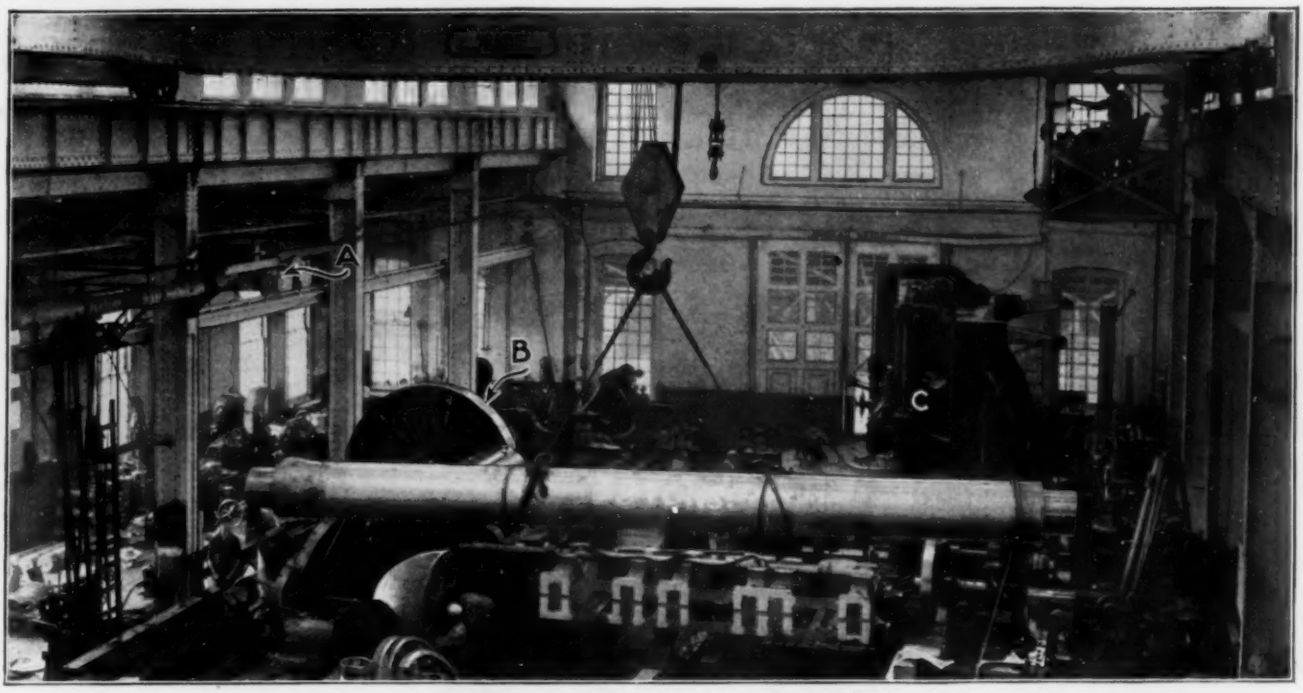


FIG. 9. THE ROLL AND ONE END OF THE MAIN SHOP

usual star feed is used, as can be seen at the end of the boring bars. At the same time a reversing shaft is being installed at *H* and other portions of the erecting being done so as to hasten the completion of the work.

Two other interesting views are shown in Figs. 5 and 6, both being operations on a Morton combination machine. The latter view also gives a good idea of the construction of the main machine shop. In Fig. 5 the work shown is an exhaust inlet for the condenser of ammunition ship No. 2, which was built during the latter part of 1919. Fig. 6 is also a condenser job, being for sea-going tug No. 31.

The Lathe Department

Going to the lathe department we have the large plate bending roll shown in Fig. 7, ready to be rough-turned as soon as the wire rope slings have been released. Fig. 8 shows the roll mounted in another lathe for the finished turning. This is a 120-in. lathe, each carriage being equipped with a motor. The handwheel on the vertical shaft at the top of the carriage controls the motor, and in fact both motors can be controlled from either carriage by means of the rod which can be seen between them, near the floor. This view shows the type of dog or driver used at the faceplate end and also the revolving carrier inside the steadyrest at *A*. This carrier is clamped to the shaft by means of the internal screws shown and revolves with it, the outer edge bearing in the steadyrest and supporting the roll against sag.

The Crane Operator

The need for supporting the roll becomes apparent when we consider that it weighs 38 tons. An idea of the size of the roll may be had in Fig. 9, where it is suspended from the 40-ton crane. This crane, it will be noted, is operated by a girl; girls in many cases having proved especially proficient in this kind of work.

This same view shows more of the shop construction, such as the small traveling crane at *A*, in the side bay. Beneath the suspended bending roll is the engine base shown on the planer in Fig. 3, and now located in the combination machine, shown in Figs. 5 and 6, with the boring bar for the crankshaft bearings, already in place. Fig. 9 also shows the 120-in. lathe at *B*, the crane having recently lifted the bending roll out of this lathe. At *C* is a large vertical boring mill, a very necessary adjunct to the equipment in shops of this kind.

Comment on Shop Politics

By W. K. Campbell

I heartily endorse everything that Cecil K. Perkins has written under the above title, on page 443 of the *American Machinist*.

It is the old story in many of our industrial plants today where some inexperienced leader is still trying to put a quart into a pint bottle, and it can no more be accomplished today than in the days of Jack Cade. While there may have been an excuse for putting the unskilled and uninitiated in high places in war times, I very much doubted it at the time and doubly doubt it now. If it takes years to train our professors and instructors in the arts and sciences, who must be trained along general lines and in the fundamentals before they take up their special lines, why should it not require a little time to train men in the many and varied fields of industrial sciences? True, our young technical graduate may do the designing and compute the stresses, but he has qualified by years of study for the work. The putting together and the knowing how to make fits and adjustments should and does require time and study, not necessarily book study, but the careful and calm consideration of the whys and wherefores, and yet some men are as Mr. Perkins says "passing the buck and bluffing" to the detriment of the mechanical field, and with such conditions prevailing is it any wonder that Joe Gilbert is constrained to write as he does on page 458, under Want Ads?

A Modern Tractor Building Machine Shop

General Layout of Tools and Equipment—Heating and Lighting Systems—Cranes and Conveyor Arrangement—Work Benches Are Protected—Fireproof Storage

By J. V. HUNTER
Western Editor, *American Machinist*

AMONG the older manufacturers of farming machinery standardization has not been carried to that length where the entire shop facilities are devoted solely to the production of a single size and type of unit. They realize the different requirements of widely separated farming localities and build a full line of equipment so as to fill all needs, and for this purpose the shop here described well satisfies all productive demands.

Some time ago the expansion in its business caused the Minneapolis Threshing Machine Co., Hopkins, Minn., to build a new machine shop which stands as one of the most modern of its type of construction in the Northwest. This shop was built and laid out with a view to handling the varied line of gas and steam engines which are built by this concern, and this necessitated a method of construction and layout that does not employ the features of progressive machining and assembly found in automotive plants, which can be devoted solely to one standard product.

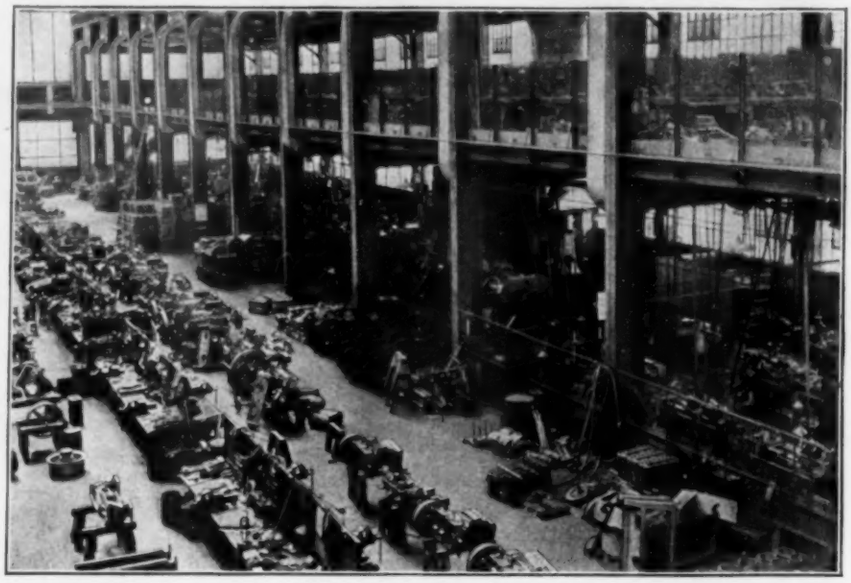


FIG. 1. GENERAL VIEW OF TRACTOR ENGINE MACHINE SHOP

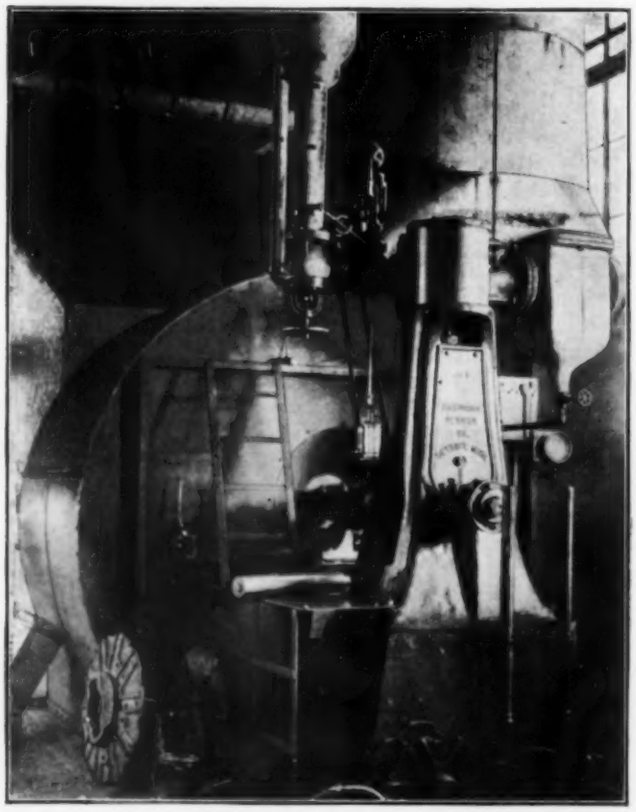


FIG. 2. ENGINE DRIVEN CIRCULATING FAN FOR HEATING SYSTEM

The main machine shop consists of a building approximately 280 ft. long by 96 ft. wide. This is constructed with a long center bay 48 ft. in width and side bays over which are located manufacturing galleries. The center bay is equipped with crane service of 10-ton capacity.

The side walls have an abundance of lighting space, which will approximate 60 per cent of the total wall area. The roof is also plentifully supplied with skylights, in fact even too much so, as the management states that in extremely hot weather the reflection and heat cast down by the skylights on the upper working galleries often becomes uncomfortable. To counteract this some of the skylights have been equipped with shades.

A general view of this shop, Fig. 1, shows that the center bay of the floor is used almost entirely for the assembly of gas engines and for the storage of finished machine parts and raw castings. This center-bay storage conveniently places all parts for access and the raw material may be quickly transferred from one part of the shop to another to bring it in line with the manufacturing machine tools, which are all located in the side bays.

Heating and Ventilating Systems

A heating and ventilating system for this shop was built by the American Blower Co. It consists of two steam coil units, one of which is shown in Fig. 2, located on opposite sides of the center of the shop. The cold air is drawn into the heating system directly from the shop through a series of steam coils in a large sheet-metal body on the far side of the centrifugal fan. The blower is driven by a "Type A" vertical steam engine, which is shown in the foreground of the illustration. From the fan the main heating pipe extends

FIG. 3. DISTRIBUTING PIPES AND HEADERS OF HEATING SYSTEM

FIG. 4. GROUP OF PARTS USED IN ENGINE ASSEMBLY

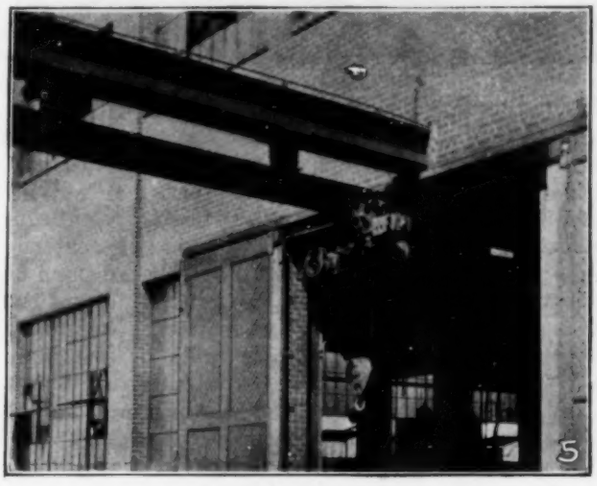


FIG. 5. MONORAIL TROLLEY HOIST AND SUPPORTS OVER AREAWAY

FIG. 6. TRACKS FOR SHIFTING CASTINGS BETWEEN MILLING MACHINES

upward through the gallery floor to a distributing header located along the ceiling.

The heated-air distributing system is shown in Fig. 3. The main pipe runs from the fan up an elbow near the roof that turns it toward the center of the shop and at a point parallel with the crane beams a great Y divides the flow between the two main headers extending to the opposite ends of the shop. On the back side of the headers are numerous openings, each regulated by a shutter, which throw the heated air to all points in the gallery. On the forward side of the header branch pipes (tapering into rectangular section as they run down along the side of the crane beams) carry the air through flared and shuttered openings into the side bays beneath the gallery.

The opposite side of the shop has a heating unit that is identical in its construction with the one shown. Although the climate of the Northwest is noted for the rigor of its winters this heating system has proved adequate.

As has been mentioned, the main bay of the shop is served by a single 10-ton crane. There are loading

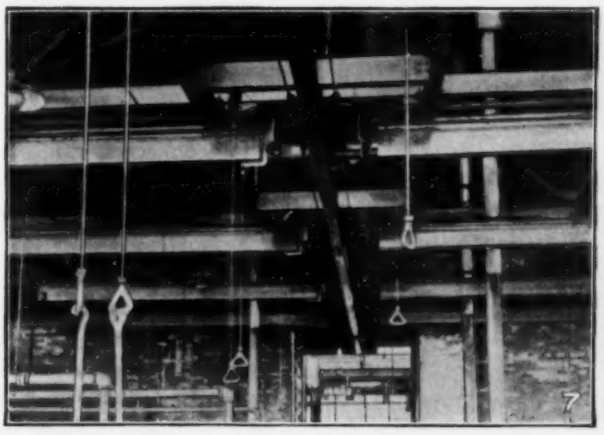


FIG. 7. OVERHEAD TROLLEY RAILS FOR SERVING TESTING ROOM

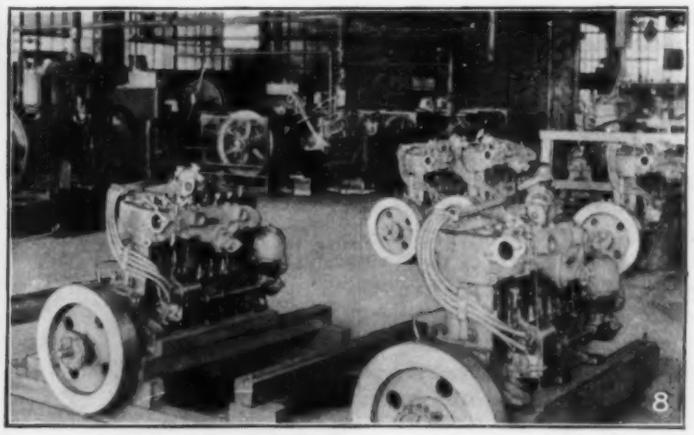


FIG. 8. ENGINES AWAITING TEST AND TESTING STANDS

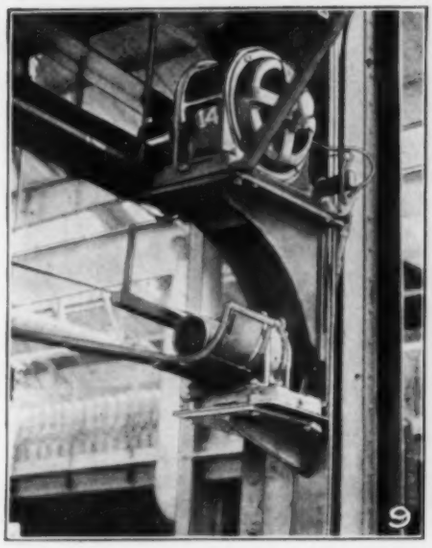


FIG. 9. BRACKET SUPPORTS AND BELT GUARDS FOR MOTOR DRIVE

FIG. 10. WORK BENCHES, CHIP SCREENS AND TOOL BRACKETS

platforms located on the galleries at both ends of the shop, so that material may be trucked to these and lowered as required to the main assembly floors. The balcony on the side shown in Fig. 3 is almost entirely devoted to bench work and to a large group of drilling machines. The balcony on the opposite side is occupied by light engine and turret lathes, except at the far end where one type of cooling radiator is made. Some space is also given to the storage of jigs and fixtures.

The main parts of the heavy tractor engine assembly are stored in the center bay, and their general character is indicated by Fig. 4. The heavy crankshafts shown in the foreground are for four-cylinder tractor engines.

Overhead Conveying Systems

The doorway in the far background shows a monorail trolley which picks up all material at the end of the travel of the main crane and either loads it on yard-trucks outside the building or carries it across into a parts-storage building.

The monorail hoist is shown in Fig. 5, at the point where the extension of the trolley system passes out of the west end of the machine shop. The trolley system is supported across this wide areaway by two heavy I-beams placed side by side with the necessary web-plates and frame to carry the trolley beams. Minor crane runways are provided at all points beneath the gallery bays where the work or machines to be handled necessitates hoist service. The special overhead construction shown in Fig. 6 employs the U-shaped form of runway. An extension bar connects the trolley with the chain hoist used for placing heavy engine castings on the tables of two Ingersoll planer type milling machines. The trolley hoist runway permits the casting to be picked up from the center bay and carried to either machine or from one to the other.

An I-beam trolley hoist serves the testing room. Its construction is shown in Fig. 7. The main track extends through the open doorway (shown in the background of the illustration) and underneath the balcony floor of the main machine shop to a point where it can be served with completely assembled engine units by the main crane. The cross-over switches permit the trolley-hoist to carry the engines out along the branch rails to the testing stands, one of which is served by each rail.

Gas Engine Testing Room

The testing room for the gas engine extends in a wing from the south side of the main machine shop, and the sloping nature of the outside ground level has permitted a high basement beneath the testing floor while keeping the latter level with the machine shop. The basement is used for the storage of finished and unfinished parts. The general construction of the testing room is somewhat similar to that of the machine shop and it is provided with ample lighting facilities.

Some of the many different types of engines built are shown awaiting test in the illustration, Fig. 8. Among these a 15-hp. vertical light tractor engine can be seen in the immediate foreground, and larger horizontal and vertical tractor engines ranging up to 40 hp. on the different testing frames. Water dynamometers are used for testing and the engines are directly connected to the same type of cooling radiators which they will use when in service, so as to detect any tendency to overheating. The engines exhaust through the pipes extending out through openings in the side windows. In the main machine shop group drive is employed for a limited number of machines but

FIG. 11. GENERAL VIEW OF PARTS-STORAGE BUILDING

by far the greater number are driven by individual motors. Among the latter many of the machines were purchased without attached motors and later equipped with individual motor drive. Arrangements were made to support these motors at convenient points close to the ceiling, or on floor columns as shown in Fig. 9, driving from these to countershafts supported from the wooden floor beams above. The motors that are attached to the floor columns are mounted on heavy cast-iron brackets, varying in size with the weight of the motor they sustain. In most cases the motors are provided with adjustable bases so that the belt can be tightened when required. Belt guards have been built beneath all main-drive bolts. The general character of this safety precaution is shown in the illustration.

Arrangements for Bench Work

Practically all of the workbenches, both on the main assembly floor and for the bench workers in the balcony, are double, one bench unit facing the other as shown in Fig. 10. Screens have been provided to prevent the chips and particles flying from one side and injuring the men working on the opposite side of the bench. This safety provision is obtained by a closemesh wire screen of heavy texture that is supported by a frame extending along the center of the tool benches.

An interesting form of toolrack is also provided which avoids the promiscuous throwing of all sharp-edged tools together in drawers beneath the benches. These brackets hang down the side of the wire screen partition, and the two sides of the frame are spaced far enough apart so that they will carry ordinary files, socket wrenches and similar tools which the workman usually has in his daily possession. These racks are made of No. 16 galvanized sheet-metal and have hooks at the top which go over the upper frame of the screen, while the bottoms are nailed to the woodwork at the back of the bench so that they will not swing out of place.

The supply storage building, which has been mentioned previously, adjoins the main machine shop, from which it is separated by an areaway. It is built two stories and basement in height, of exceptionally heavy slow-burning timber construction with brick walls. It was designed to sustain a floor load of 200 lb. per square foot, and its heavy construction is indicated in Fig. 11.

A single freight elevator is located in the center of the building.

Metal Cutting Tools—IX

By A. L. DeLeeuw

(Continued from issue of April 28.)

IN FIG. 150 is shown the principle of construction of the form-mill. *ABCD* is one tooth which is built up out of small sections; each section has two lines which run toward the center of the mill. All the sections are exactly alike. Each one is provided with the necessary clearance. If we should make a cutter in this fashion and grind away the first section there would be left a cutter of exactly the same contour. Grinding away the second section will still leave the contour unchanged, an so on. As a matter of fact, these sections are of infinitesimal thickness, in other words, the tooth is not made up out of layers which we can observe and the outline of the tooth is not stepped but is made continuous as shown in Fig. 151. This is done by the backing-off machine, and by using a tool which has the same outline as the piece to be milled. The method of making these backed-off cutters is too well known to go further into detail.

What we have said so far is to bring out clearly that what we should do to preserve the form is to remove by grinding one complete section. However, there is no way of finding out where one section ends and another begins in a form cutter. This is the cause of a great deal of trouble. If formed cutters had the teeth spaced absolutely evenly, if the hardening had not spoiled this spacing, and if then we should grind to the center and take care that with the last grinding cut we remove only a very small amount of metal, so that the teeth will be spaced evenly just as when the cutter was new, then we would have a proper cutter after grinding.

However, we cannot rely on the original spacing of the teeth, and we can say almost with certainty that the subsequent hardening has distorted this spacing to some extent; so that there is no way of finding out just how we should grind a form-mill in order to have all the teeth act to the best advantage. This faulty grinding of the form-mill is one of the main reasons why this mill is not as productive as it might be, and why a form-mill, as a rule, takes very much lighter cuts than a spiral mill.

Various methods are employed by careful shopmen to make the teeth of a form-mill act as evenly as possible. The teeth are indicated after grinding so as to make sure that all work to the same diameter and there are grinding machines in existence which are built on this principle of indicating the teeth. A better plan—better because the methods employed are more rugged and require less skill and care—is the following:

Referring to Fig. 150, let us imagine that a form-mill is made as indicated in this illustration. Let us imagine that every tooth has four sections, such as shown in the one tooth. Let us further imagine that the teeth are not evenly spaced and that the first sections of the various teeth are not necessarily set to the same diameter. In order to grind such a cutter we would place a stop somewhere so that one of the sections of tooth No. 1 rests against this stop. Let us say that section No. 1 of tooth No. 1 will bear against the stop, and further, that section No. 3 of tooth No. 2, section No. 1 of tooth No. 3, section No. 2 of tooth No. 4, all would bear against this same stop. Then if we employ this stop for holding the cutter while we grind the back of the teeth, we will produce a cutter of which the backs of all the teeth are located in the same relation to some section of the teeth. And if, then, we should grind the front of the teeth all alike relative to the back of the teeth, these teeth would all be of the same diameter.

In actual practice we place a solid stop and bear the cutter hard up against it, as shown by the arrow, Fig. 151, after which we grind the back of the teeth. After grinding one tooth we lift the cutter up, turn it through a certain distance, bring it down and bear the next tooth up against the stop. If the tooth bears against the stop at the point *A*, the point *A* of every tooth would be the

same distance from the center of the cutter, and as all the backs of the teeth are ground in the same relation to these points A, the backs are now a starting point for future sharpening.

The life of a form cutter becomes much greater and it becomes possible to take much heavier cuts when this method of sharpening is followed. Although it is somewhat of a bother to lay out the form tool with which the backing-off is done in such a manner that rake can be given to the cutter, this should be done in most cases for the effect of rake on the productivity of the cutter is even more marked with a form-mill than with plain or spiral cutters.

As a rule the movements produced by the backing-off machine are such that the amount of clearance at the various points of the cutter tooth are not the same, so that the conditions of cutting change somewhat after each successive resharpening. However, this change is so small that generally speaking it is of no practical importance. What is of importance, though, is the fact that the amount of clearance at various points of the cutter may vary largely on account of the shape of the cutter itself. In Fig. 152 a single tooth of a form-mill is shown. This mill would produce a half-round groove.

The form tool used in backing-off this mill is shown in close proximity to the tooth. The tool moving in the direction of the arrow will back off the tooth from A_1 to A_2. In doing so it produces two half circles going through A_1 to A_2 respectively. Any two points of these two half circles situated in a line parallel to the movement of the form tool will always be the same distance apart. For instance, A_1A_2 equals B_1B_2. This distance A_1A_2 is what produces the clearance at A_1, but the distance B_1B_2 does not produce the clearance at B_1. At that point we would have to draw a line at right-angles to the work, B_1B_3, and the distance between the two half circles on that line would be the distance which produces the clearance. In this case it would be the distance B_1B_3. At the point C this distance would be very small, and still further down the clearance would entirely disappear. This condition is very marked whenever the cutting portion of the tooth approaches a direction at right-angles to the arbor. The full effect of the clearance is only felt when the surface of the tooth is practically parallel with the longitudinal axis of the arbor.

Fig. 153 shows a form-mill. From A to B the cutter has the full benefit of the clearance. From B to C the the clearance has almost disappeared. From C to D the clearance is diminished but not lost. From D to E the cutter has the full benefit of the clearance. From E to F the clearance gradually diminishes again and is zero at F. From F to G the cutter again has the full amount of clearance.

If a cutter were required of an outline as shown in Fig. 154, there would be no clearance at the points A and further to the center because the clearance would be formed by the dotted line which meets the full line at A. However, it is possible to make such a cutter with clearance all around. To do this the form tool is made as shown in Fig. 155, and is placed on the toolslide of the backing-off machine in such a manner that its movement will first be in the direction of the arrow No. 1. After the left side of the cutter has been backed off, the toolslide is changed so as to move in the direction of arrow No. 2. The result will be that clearance will be provided as shown by the dotted line.

This method solves the problem of providing clearance at all points but introduces a new problem. If we should imagine the cutter being ground away down to the dotted line, we would again have a cutter of the same general configuration, but not of the same size as the original cutter. The problem, however, is easily solved by making the cutter interlocking. Wherever a complicated cutter has somewhere a straight line in its contour and parallel with the direction of the arbor, this method can be employed.

This method, then, could be employed on a convex cutter. On a concave cutter, such as is shown in Fig. 156, we can make it again interlocking, but we would not succeed in getting a perfect half circle. There are many cases where it is of more importance to have some clearance than to have a perfectly correct outline, and this method of giving side clearance and making the cutter interlocking can be used many times to good effect in practice.

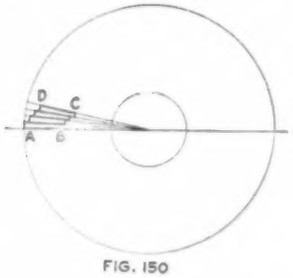


FIG. 150

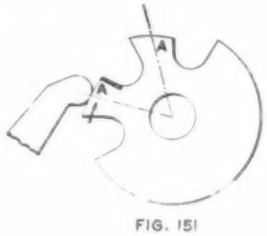


FIG. 151

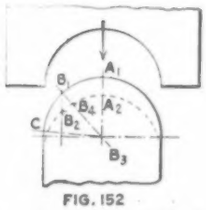


FIG. 152

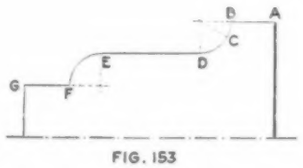


FIG. 153

FIG. 150. PRINCIPLE OF CONSTRUCTION OF FORM-MILL. FIG. 151. FORM-MILL AND GRINDING STOP. FIG. 152. ONE TOOTH OF FORM-MILL FOR SEMI-CIRCULAR GROOVE. FIG. 153. A FORM-MILL SECTION

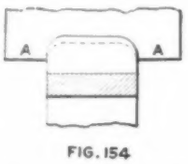


FIG. 154

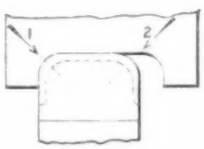


FIG. 155

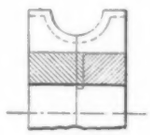


FIG. 156

FIG. 154. CUTTER WITHOUT SIDE CLEARANCE. FIG. 155. ARRANGEMENT TO GIVE SIDE CLEARANCE. FIG. 156. INTERLOCKING CONCAVE CUTTER

The beneficial effect of rake on form cutters was mentioned before. This good effect is not only due to the fact that less power is required to take the chip, but also because, to a certain extent, rake produces the same effect as spirality of the teeth. In Fig. 157, OA is the radius to the farthest projecting point of the cutter, and OB is the radius to the deepest point of the tooth. When the tooth AB has reached the work at A a cut begins at that point, but the cut does not yet begin at B, and will not begin until B has reached the point C. This is exactly what would happen if there were no rake, but if the points A and B had been located on a spiral.

The amount of spirality depends on a number of things: on the diameter of the cutter, the angle between OB and OA, the depth of impression AC and the contour of the cutter. If, for instance, the cutter had a shape as

shown in Fig. 158 in which *ABCD* is the cutting tooth, we would find that the rake does not have the effect of spirality from *A* to *E* or from *B* to *F*. From *E* to *G* the effect would be quite marked; from *G* to *H* it would be very little; from *H* to *I* it would be considerable; from *I* to *K* it would be practically nothing; from *K* to *L* it would be much like that from *E* to *G*; from *L* to *M* it would be very marked, etc.

This peculiarity of the cutter with rake is so marked that to the casual observer the action of a form cutter with rake resembles much more the action of a spiral cutter than that of an ordinary form cutter.

The fact that the amount of rake is not the same at *A* and *B*, or for that matter, at any of the intermediate points has been mentioned before. In Fig. 159 the rake at the point *A* is given as 10 deg., the diameter of the cutter is supposed to be 3½ in. and the depth of impression is ½ in. Under those conditions the rake at point *B* will be 14° 2′. Under ordinary circumstances this difference in rake is not very great, but with gear cutters, or any other cutters where the depth of impression is great as compared to the total diameter, the difference in rake is enough to require careful consideration. Not

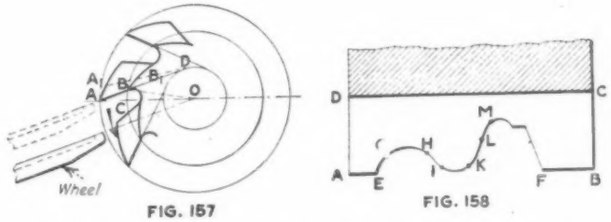


FIG. 157 FIG. 158

FIG. 157. GRINDING RAKE ON A CUTTER. FIG. 158. CUTTER WITH VARYING SPIRALITY

only is the rake different at the points *A* and *B*, but this amount of rake changes again after the cutter has been ground a number of times, because then both the points *A* and *B* will be located on smaller diameters. As a rule this difference is not great enough to cause trouble. However, when formed end mills are used which are naturally smaller than cutters of the same contour, but used on an arbor, the diameter at *B* may be so small relative to the diameter at *A*, and the diameter at *B* may become so small after repeated grinding, that it is well to calculate the amount of rake which should be given at the point *A* in order not to have too much rake when the cutter is nearly worn out.

Though the following points might properly be taken up in the chapter on grinding cutters, it is perhaps better to point out here how a form cutter with rake should be ground in order to preserve the same contour. In Fig. 157 the line *AB* is drawn tangent to a circle *OD*, the circle being of such a diameter as to produce the desired angle at the point *A*. If the cutter is dull and we wish to regrind it, we must grind off a slice until we get the line A_1B_1, and this line A_1B_1 should again be tangent to the circle *OD*. At first glance it might be thought that we would set the cutter with the line *AB* horizontal and then turn it downward through an angle equal to the rake angle at *A*, say 10 deg. But if we did so we would also make a rake angle of 10 deg. at the point A_1 and this would cause a change in the contour of the cutter. What we should do, therefore, is to find the diameter of the circle *OD*, place the wheel central with the cutter as shown in the illustration and then move the cutter at right-angles to the wheel a distance equal to the radius *OD*. As a rule, form cutters with rake have the rake angle marked on the cutter. This is not correct, as there is not one single rake angle even when the

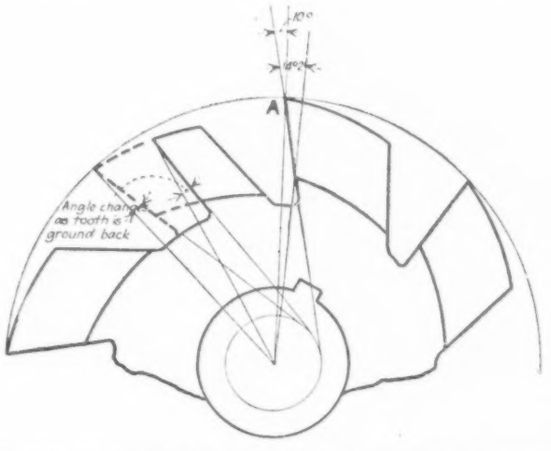


FIG. 159. CHANGE OF RAKE ANGLE DUE TO GRINDING

cutter is new, and if there were, it would be lost at the first grinding. *The cutter should be marked with the size of the circle OD.*

To illustrate the effect of this faulty grinding on the contour of the cutter a cutter of simple shape is shown in Fig. 160. The conditions are somewhat exaggerated because it is not very well possible to show defects of a few thousandths of an inch on a small scale drawing. The full line shows the original contour. The compound line shows the contour we should have after grinding, while the dotted line shows the contour we will get if we maintain the original rake angle at the extreme point. The angle *OAB* is the original angle. The cutter is supposed to be ground so that the angle *OCD* equals angle *OAB*, whereas the angle to which it should have been ground is angle *OCE*. The two lines *CD* and *CE* intersect the cutter at *F* and *G*, and when projected give the points F_1 and G_1. It will be noticed how this changes the outline of the cutter after grinding.

The manner in which a cutter is backed off is well known. If the cutter is without rake a form tool of the desired shape is placed with its cutting edge on a level with the center of the cutter. The slide to which this tool is bolted has a motion toward and from the cutter center, controlled by a cam, and making one movement for each tooth in the cutter. A greater amount of eccentricity of the cam would give more clearance, an irregular shape of the cam would give an irregular clearance, etc. Whatever the peculiarities of the cam may be, any section of the tooth taken toward the center of the cutter will have the same contour, namely, the counterpart of the contour of the form tool.

Conditions are not so favorable when a form cutter with rake must be backed off. In order to do this properly the tool must be set above or below center and must have a contour different from the contour of the work to be made by the mill. In Fig. 161 a cutter of 3½ in. diameter is represented, with a depth of impression of about ½ in. The point *A* is shown on the horizontal line. The point *B* will make its proper impression when it has reached that line. It reaches the line *OA* by swinging around the point *O* as center. This point will be point *C*. Another point is shown on the line *OA* obtained by drawing a perpendicular from *B* to *AO*. A number of

these perpendicular lines are shown indicating that we had obtained the contour of the form tool by laying out the proper shape in the plane of *OA* and raising per-

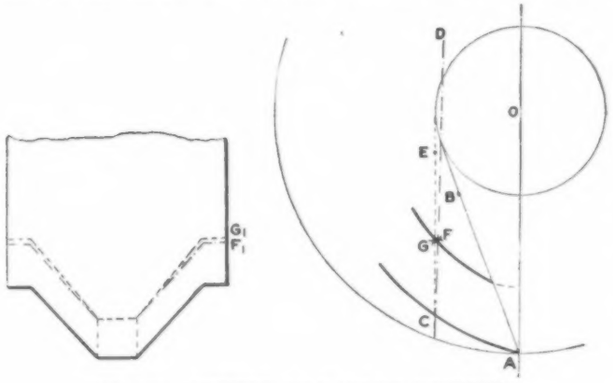
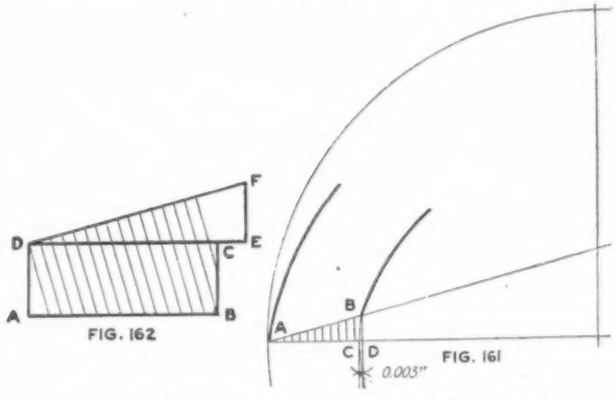


FIG. 160. EFFECT OF FAULTY GRINDING

pendiculars at the various points of that form and intersecting a plane going through *AB*. In this manner the point *B* is the projection of *D*. If we make *AB* exactly ½ in. we will find that *AC* is 0.003 in. less than ½ in. In other words, if we have made our form tool in the manner described we will get a shape which is 0.003 in. undersize.

This error may, or may not, be more than what is per-



FIGS. 161 AND 162. METHODS OF LAYING OUT FORMED CUTTERS

missible. If it is not permissible then the manner of making the form tool should be this: The various points of the form tool should be laid out along the line *AO* and should be circled over until they strike the line *AB*. The points thus obtained would be the corresponding points for the form tool. This is an elaborate method of laying out and might easily lead to a greater error than 0.003 in.

The other method, the raising of perpendiculars on the points of *AO*, leads to a simple way of making the form tool. In Fig. 162, *ABCD* is the piece of steel of which the form tool should be made. A wedge *DEF* with the same angle as *BAC* is placed on top of the piece of steel. The form tool is laid out so as to give the exact shape desired on the plane *DF*, and is then filed out perpendicular to that plane as shown in the figure. If the wedge is then removed the shape of the impression in the piece *ABCD* is the same shape as we would have obtained by projecting the various points of *AD* (Fig. 161) and that without the necessity of transferring drawings or dimensions. The piece *DEF* may be a separate piece clamped to *ABCD*, or it may be made in one with it and planed off later. The first method may be preferable, especially if the form tool is made of high-speed steel.

The Unostentatious Foreman

BY L. L. THWING

Speaking of foremen, every shop has several varieties, particularly if it is an old shop and has developed, or rather selected, them from its own ranks. Some are placid, some are nervous, some make a lot of fuss and appear to get results only by constant agitation, while others never seem to be doing anything but still they get out the work. I have one of these in mind now. Whenever you went into his room you would find him at his desk; only rarely would he seem to be giving his personal direction to any work. He was never hurried, and his men never seemed to be, but we never had to worry about his part in the chain of production. But for all his being so inactive, he knew what was going on in the shop. If Bill Smith telephoned down that he must have 200 No. 7 boxes by the next morning, he knew whether Bill was stating facts or getting ready an alibi for some of his own shortages. He knew, too Bill had fifty of these hidden away for an emergency.

If the foundry stopped work on some of his jobs he knew about that also, and he was nearly always able to get it put back, even when other work was more badly needed. In short he knew "the ropes" around the shop, and had a good pull on most of them. He belonged to the generation that started work at 6 o'clock and he still clung to these hours.

He was clever, too, at choosing and handling men, and most of them had been with him a long time. He had a few that none of the other foremen could handle, but he seemed to be able to put up with one or two periodical drunks, two Armenians with a tendency to run amuck, and one epileptic. He may have figured that these five men were worth about four from a productive standpoint, and when he saw signs that Joe Egan was due for a drunk, he began to accumulate an extra supply of "P-sixes" against the Monday morning when Joe's lathe would be idle. When he saw the epileptic begin to jump and fidget, he took him off the shaper and set him to lapping out bushings. And right after one Armenian ran his truck over the other's toe, he put one in one corner of the room riveting on striker arms, and the other in the most distant corner chipping snags off a lot of die shoes.

I do not believe he was much of a mechanic himself, and I suspect that he relied on his ability to pick out men who were skilled in that line and then left all question of method with them. He would listen to any explanation or suggestion without a word but if there was anything wrong or anything that he did not understand, sooner or later there would come a ring on the drafting room phone, and we might be asked a few questions that we could not readily answer.

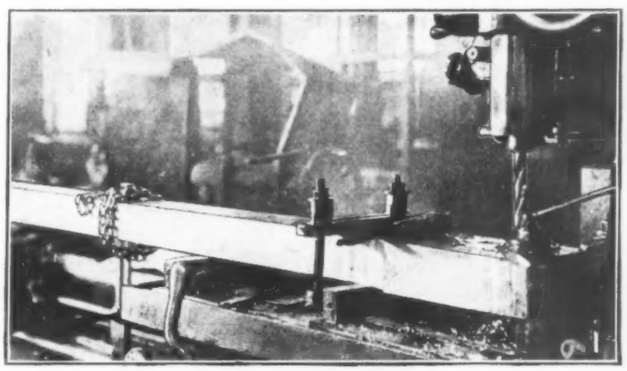
I do not know that old Dan could qualify as a modern type of foremen; appearances were against him and one had to live with him a long time to appreciate that even if he was no hustler, he did get the work out. His specialty was operating men and not machines, and who shall say that the generally accepted methods of the general manager's office are not to a large extent applicable to the foreman's desk.

Machining Operations on Locomotive Connecting Rods

A Number of Operations Are Required in Making Connecting Rods—The Principal Machining Is Done on a Milling Machine

By FRANK A. STANLEY

THE illustrations show some machining operations on heavy forged connecting rods for locomotives, including work on both the main and the side rods. The photographs were taken in the shops of the Southern Pacific Co. at Sacramento, Cal., and represent the practice at that place.



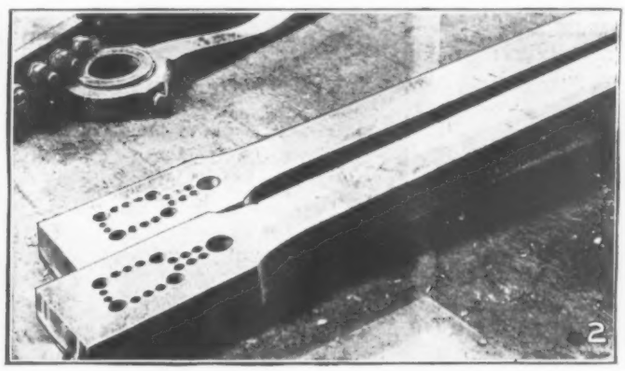


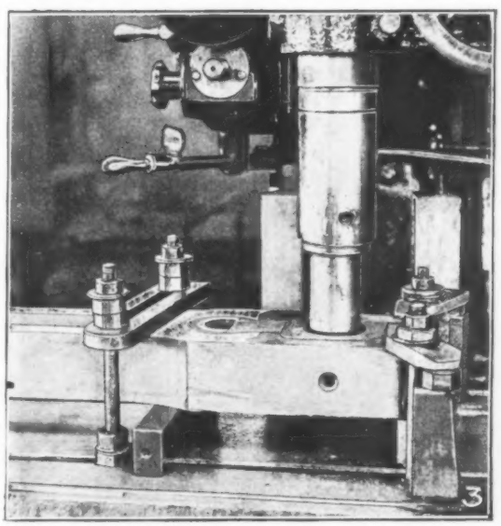
FIG. 1. DRILLING THE SOLID END OF THE MAIN-ROD. FIG. 2. BACK END OF MAIN-ROD READY FOR CUTTING OUT HOLE FOR THE BRASS

Considering first the main rod, Fig. 1 illustrates the drilling of the solid end of the forging after the sides and edges have been milled flat and square. The ends of rods already drilled, as they appear when ready for the machining out for the bearing brasses, are shown in Fig. 2.

After the metal has been cut out between the drilled holes and the opening machined to the required dimensions by means of an end mill in a vertical-spindle milling machine, the brass is fitted in place and the connecting rod is again put in the drilling machine for the boring out of the brass. This boring operation is accomplished in the manner represented in Fig. 3. A single-pointed boring tool is held in a short, solid bar carried by the heavy drilling machine spindle, and this tool bores out the hole in the cast brass to the required diameter.

Channeling the Main Rod

The milling of the channels along the sides of the main rod to proper depth and width is done on a horizontal milling machine, as shown by Fig. 4. On the sides of the rod illustrated, the channels are cut $3\frac{1}{2}$ in. wide by $1\frac{3}{4}$ in. deep, leaving $\frac{1}{2}$ in. thickness of metal in the web at the center of the rod. A cutter about 7 in. in diameter is used on the spindle of the milling ma-



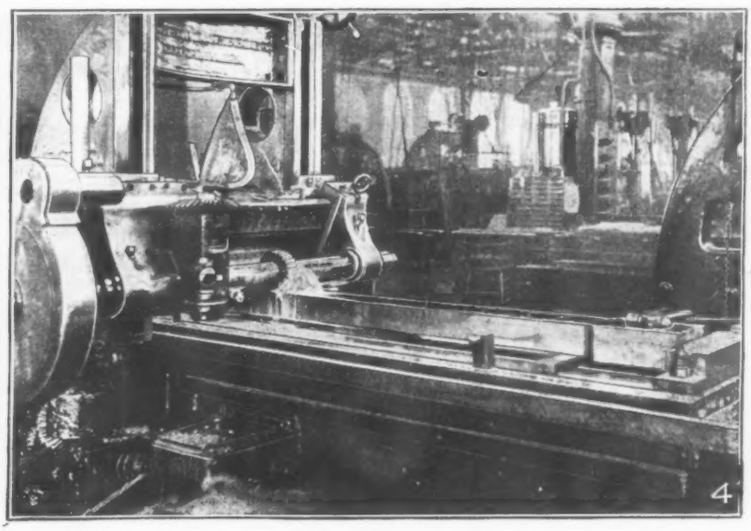


FIG. 3. BORING OUT THE BRASS IN THE SOLID END OF THE ROD. FIG. 4. MILLING CHANNELS IN MAIN-ROD

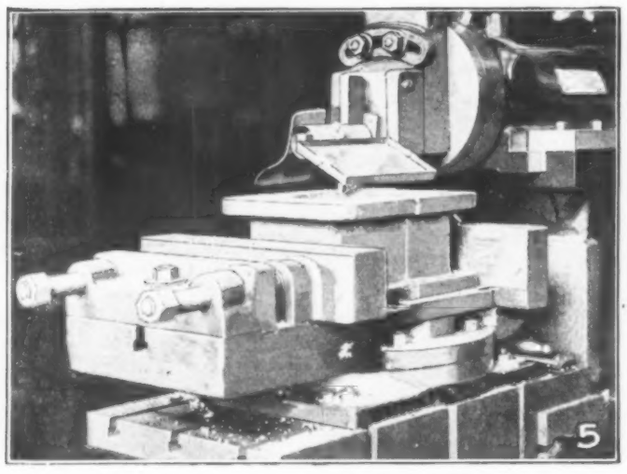
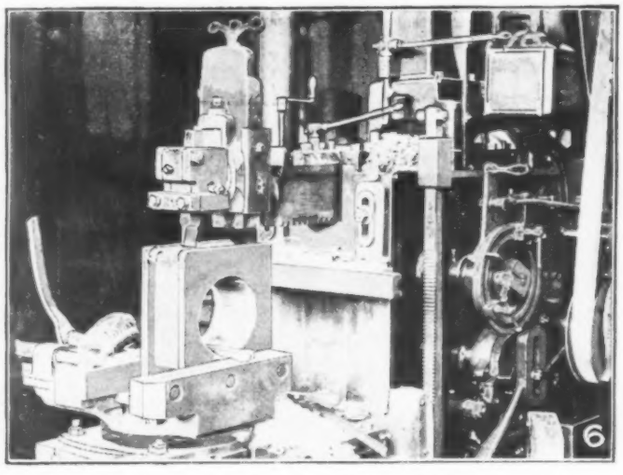


FIG. 5. FACING THE BRASSES FOR THE STRAP END IN A SHAPER. FIG. 6. FINISHING EDGES OF BRASSES IN A DRAW-CUT SHAPER



chine, the width of the cutter being 2 in. Two cuts are taken to bring the channel to width, each cut being made to full depth, or $1\frac{3}{4}$ in. The length of the cut is 65 in. In taking the channeling cut, the cutter is operated at 50 revolutions per minute, which means a surface speed of 84 ft. per minute. The rate of longitudinal feed given the work against the cutter is 2 in. per minute.

The machining of the flanged brasses for the strap end of the connecting rod is shown in Figs. 5 and 6. The first of these views illustrates the shaping of the sides of the big brasses, with the work held in the

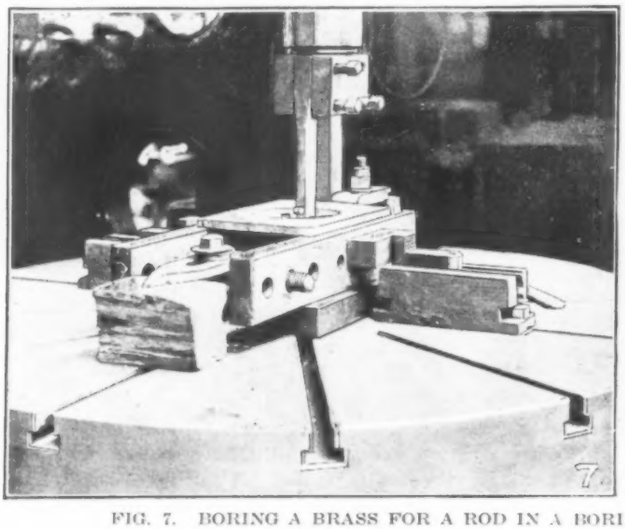
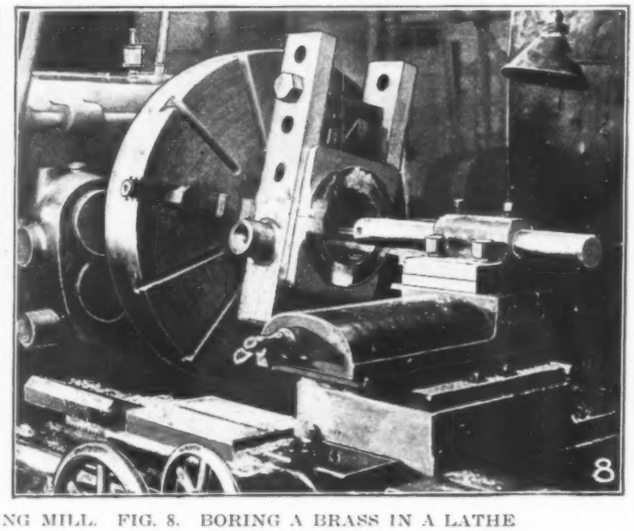


FIG. 7. BORING A BRASS FOR A ROD IN A BORING MILL. FIG. 8. BORING A BRASS IN A LATHE



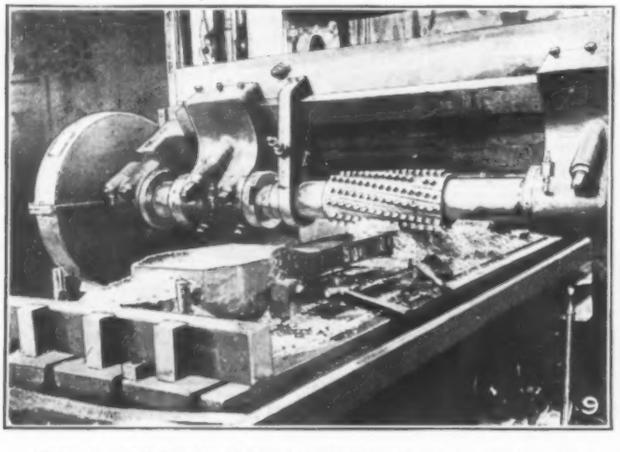


FIG. 9. MILLING SIDE OF FORGING FOR SIDE-ROD

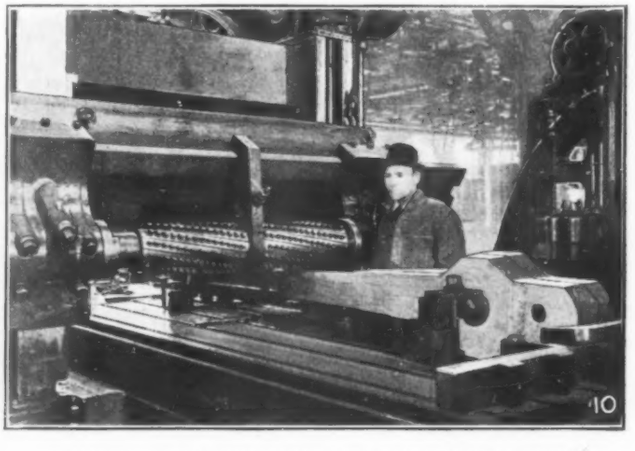
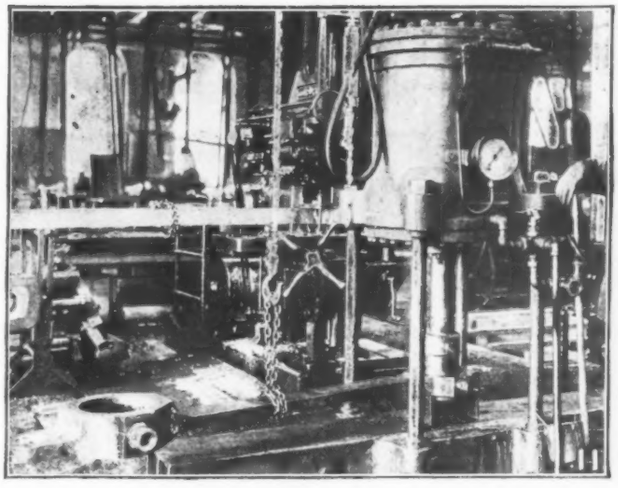


FIG. 10. MILLING EDGE OF SIDE-ROD FORGING



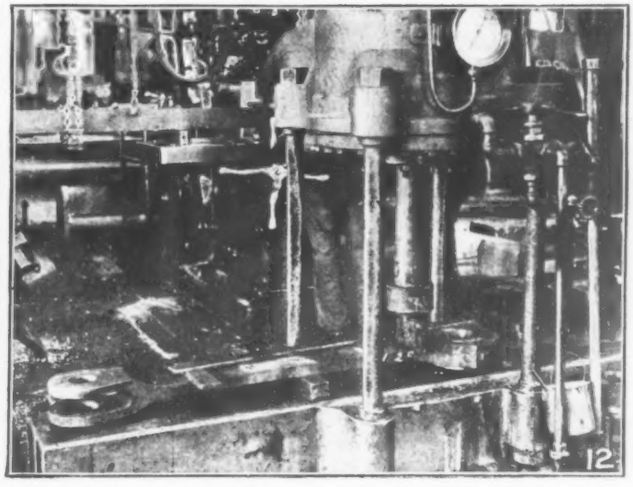


FIG. 11. PRESSING BUSHING IN FRONT SIDE-ROD. FIG. 12. STRAIGHTENING A BACK SIDE-ROD

vise on the table of a shaper. In this operation a transparent guard in a metal frame is carried by the toolpost, so that the brass chips are prevented from flying and at the same time the machinist can examine the work freely. A draw-cut shaper is shown in Fig. 6 in the operation of machining the flanged edges and bearing surfaces around the four sides of the brass. Here the work is again secured in the vise of the shaper, but this time in an upright position.

Two different ways of boring the main-rod brasses are represented in Figs. 7 and 8. In the first method the work is held in the strap, with the latter mounted on parallels on the table of the vertical boring mill. The other method is to mount the strap and brass in the four-jawed chuck of a big lathe, as shown in Fig. 8, and bore the brass with a toolbar carried on the toolslide of the lathe.

MILLING THE SIDE-ROD

The milling of a side-rod forging is illustrated by Fig. 9. The removal of the heavy cuts from the sides of the forging is accomplished on a horizontal milling machine with a big inserted-tooth cutter, shown in place on the arbor of the machine. This cutter is over 22 in. wide across the face and 10½ in. in diameter. It is fitted with twelve rows of 1-in. high-speed-steel teeth inserted in helical lines across the face of the cutter body. In taking the cut shown, the cutter is rotated at 28 turns per minute, or at a surface speed of 66 ft. per minute. The rate of feed is 1½ in. per minute. The amount of metal removed from the side of the forging in the one cut is ⅜ inch.

The edges of the side-rod forgings are milled in the manner shown in Fig. 10. In this case there are two of the large inserted-tooth mills set up on the machine spindle, each cutter being adapted to milling the edges of two side-rod forgings at once. Thus, four forgings can be edged at one setting, although the view actually shows only two, both of which are being machined under the further cutter. The amount of metal to be removed from the edges varies from ⅜ to ½ in. until the large end is approached, where the stock milled away is 2 in. or more in depth for a distance of a few inches. The ends of the rods have a thickness of from 3 to 4 in. and about ½ in. of metal has to be removed from each side, this being taken in a single cut. The feed of the work to the cutter is 2 in. per minute. The speed of rotation of the cutter is the same as for the slabbing operation shown in Fig. 9, or 22 revolutions per minute.

The rounded ends of the front and back side-rods are machined to the radius desired by mounting the work upon a rotary table on a vertical-spindle milling machine and using an end mill.

In Fig. 11 a front side-rod is shown under a pneumatic press for the forcing in of the brass. In Fig. 12 the same press is shown in the operation of straightening a rear side-rod.

The milling out of the forked end of the rear side-rod is accomplished upon a large horizontal milling machine with a 2-in. helical cutter 9 or 10 in. long, in order to reach across the widest portion of the rod end, which measures 8 in. across the forging.

"Black Nickel" Plating Solutions*

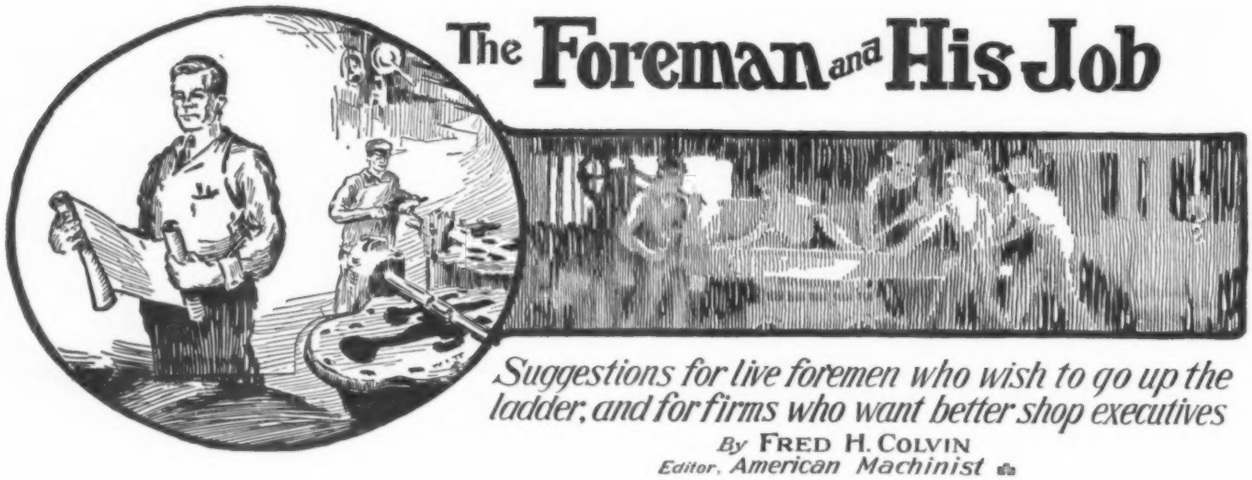
Numerous formulas have been proposed for the production of "black nickel" deposits such as are used extensively for producing a dark or black finish upon brass or other metals. Two types of solutions have been used, namely, the alkaline, cyanide solutions and the neutral sulphocyanate solutions. Experiments showed that the former were very difficult to prepare and maintain of uniform composition, and therefore they cannot be recommended. It was found that a sulphocyanate solution having the following composition proved satisfactory:

	oz./gal.	g/l
Nickel ammonium sulphate	8	60
Zinc sulphate	1	7½
Sodium sulphocyanate	2	15

It is desirable to keep in suspension an excess of zinc carbonate, which maintains the neutrality and the zinc content of the solution.

"Black nickel" plating may be applied successfully to brass, either directly or after copper plating, to copper, and to steel which has been first coated with copper, nickel, or zinc. Where protection against corrosion is desired, the "black nickel" should be preceded by zinc plating. The wearing properties of the "black nickeled" surface are largely determined by the quality of the lacquer subsequently applied.

*Abstract of Technologic Paper of the Bureau of Standards, No. 190, by George B. Hogaboom, T. F. Slattery, and L. B. Ham. The complete paper may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price five cents.



The Foreman and His Job

Suggestions for live foremen who wish to go up the ladder, and for firms who want better shop executives

By FRED H. COLVIN
Editor, American Machinist

ONE of the vital essentials for foremen—even more than for others—is open-mindedness, the willingness to hear new ideas, to see new methods and to give them a fair trial. No matter if they seem to be wrong, if they seem contrary to his own best past experiences, there is a bare possibility that they will work just the same. Men of set ideas, who adhere to the past and always try to prove new ideas wrong, do not get very far up the ladder of shop management.

Men who never change their opinions are a handicap to progress. The man who boasts that you "always know where to find him" on all questions is simply advertising the fact that he is too stubborn or too unprogressive to consider or try new ideas. The fear of being called changeable or inconsistent has held many a good man in bondage to old ideas. The sphinx is unchangeable but it does not progress.

CHAINED TO THE PAST

The man who can keep an open mind for new things, who will neither favor nor condemn them just because they are new, but who keeps a sane viewpoint and balances the possibilities of the new against his experiences with the old, is the man who will go far in these days when real executives are needed as never before.

Learn Why Things Fail

It often happens that a plan or an idea which failed in the past, may work well now because of changed conditions. This makes it necessary to analyze the *reason* for failure in the past, before condemning any plan or idea to make sure whether the reason for failure still exists or not.

Snap judgments may appeal to some but they frequently work injustice to individuals and cost the firm money. Indecision is equally bad. Study the reasons and arguments on both sides, and then decide as promptly as necessary.

An open mind is especially necessary in shops where workmen's committees are in existence. Plans are likely to be suggested which the experienced executive has good reason for believing impracticable. But no plan or suggestion should be arbitrarily laid aside or dismissed. Reasons must be given in all cases if confidence is to be secured and maintained.

The best way is to ask questions as to details instead of condemning the plan. Perhaps something of this sort might help. "The plan sounds good and seems to have some good points. But what is your idea of handling this detail?" "You know we can't get that kind of stock except as a special order and at a special price—so we have to use the other." "How would you get over this difficulty?" etc., etc.

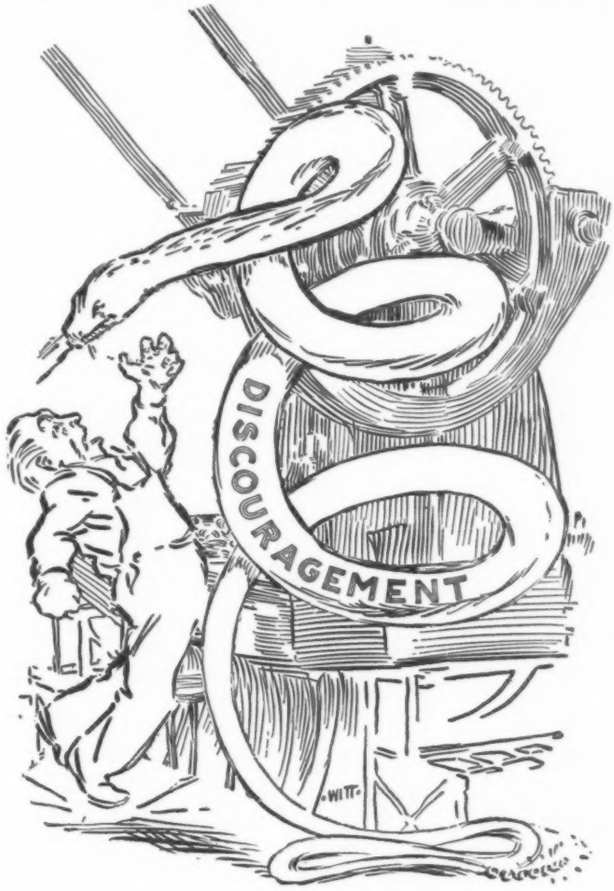
Shop Diplomacy

It is rarely best to decide against a plan instantly or to condemn it without taking a little time to talk with the one who proposed it. Get his point of view, his reasons for thinking it an improvement. Then, if the plan is not practicable, lead him to see it by "I wonder how we would handle such a case as this," and make him see that his plan will not be satisfactory. Don't make the mistake of trying to show him how much more you know about such matters

than he does. You know it and so do others. But you ought to know more—that's what you are hired for and paid for.

By handling the situation with tact and kindly interested, you can make a friend instead of an enemy. You can encourage more suggestions along better lines instead of discouraging them. And discouragement is one of the grave dangers in industry today. We want workers who take an interest in their jobs, to whom the shop is more than a place to work, a place with many things of interest, where the worker helps to build worth-while machinery which adds to the welfare of the world.

With ideas of this kind in his head, the foreman himself will get more out of life. The men in the shop



DISCOURAGEMENT LOOMS LARGE

and the shop problems themselves will take on a different aspect, and life in the shop will become more interesting in every way.

The old idea that the foreman should have all the knowledge and wisdom to propose new ideas, is rapidly passing. His experience and training will naturally give him many new ideas, or new applications of old ideas. But the foreman who can encourage his men to develop new methods of doing work, new plans for utilizing machines, makes himself of great value to his employer.

With practically every man in the department thinking of new and improved methods, the foreman may be sure that his department will be at the top of the list and that his fame will be in no-wise dimmed because some may consider it as reflected glory.

The Present Status of the Metric Argument

By Frederick A. Halsey*

The persistence of old units in so-called metric countries being now established, it is proper to point out its significance.

Prior to this discovery it was accepted by all that the countries claimed to be metric were so in fact. So far as known no one suspected and certainly no one had proved the contrary.

Until the discovery the anti-metric argument was two-fold:

(1) The merits of two systems were discussed and the superiority of the metric was denied. For example, the paper by Dr. Sellers read at the first meeting of the A. S. M. E., showed that the Sellers' works had tried the metric system and did not like it.

(2) The cost of changing systems was also discussed and there was very little to place against the claim for the superior simplicity of the metric system and nothing to controvert the claim that it is universal, except in English speaking countries. The metric party assumed that the countries that had tried to adopt the system had succeeded and from this assumption they argued that the change could easily and quickly be brought about. Granting the assumption, the argument seemed conclusive and against it we had nothing to offer except the opinion of the meeting.

The discovery that the assumption is false, that the so-called adoption of the system was in most cases nothing more than its introduction and in all cases very imperfect revolutionized the argument.

Not Universal

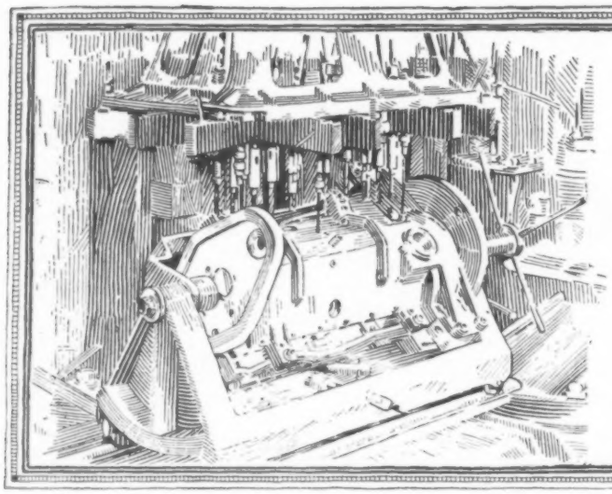
Against the claim that the system is universal nearly everywhere, we now have proof that it is universal nowhere. And against the repeated assertion that the change is easy, we have proof that it is of such difficulty that no country has completed while few have made much progress toward it.

Even more important, the entire case for the system based on its supposed greater simplicity has become purely academic. We must compare what we have with what we will get, not with what it is hoped we will get. And we will get what others have got—a mixed or dual system—a condition in which the new units have merely been added to the old; a condition that not only destroys all arguments that have been advanced by the metricites but inverts them and turns them against their advocates. Thus we will have more, not fewer, units; more and worse, not fewer and better, ratios; more complex, not more simple, calculations; more, not less, for school children to learn and in general diversity and complexity, not uniformity and simplicity; trying situations with most difficult solutions.

Incidentally the facts now established demonstrate the ignorance of those who claimed the contrary. It is now clear that having no knowledge of fundamental facts they assumed as true whatever they wished to be true and based their claims on these convenient assumptions. There never was a better illustration of the aphorism: Repeat a statement often enough and you will be believed.

The simplest possible application of the facts is to show the futility of our trying to do what so many have tried and failed.

*Commissioner American Institute of Weights and Measures.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Albert A. Dowd Engineering Co., New York City

Drill Jig Design Continued—Clearance for Work and Chips—Provision for Wear on Locating Surfaces—Setting Up and Removing Work—Types of Jigs

WHEN designing, the matter of clearance around the work between the walls of the jig and the work must be given careful consideration. An example to illustrate this point is shown in Fig. 22. In this case the work *A* is located on a stud *D* placed in the body of the jig, which is made of cast iron. Now assuming that the work *A* is a casting, there is likely to be some variation in its outside dimensions; if the jig body *B* is also a casting there is likely to be some variation in its dimensions as well. Therefore the clearance as indicated at *C* between the walls of the jig and the work should be ample to allow for variations in the castings. As a general thing the distance *C* should never be on small work much less than $\frac{3}{8}$ in., that is to say on a piece of work having dimensions about 4 x 6 in. On larger work which may run to 18 or 20 in. or even more the clearance would be correspondingly greater. The writer has known of several cases within the last year where the clearance around rough castings of large size has not been sufficient to take care of variations. In one case the matter became so serious that it involved practically the rebuilding of a large part of an expensive trunnion jig. It is evident therefore that the matter of clearance around the work in a jig must be given the most careful consideration.

Many designers do not pay enough attention to the matter of cleaning a jig. It is evident that when work is being produced on an interchangeable basis by the use of jigs and fixtures there is a great accumulation of chips which must be removed from the jig as each new piece is placed in position. Now, up-to-date production methods call for rapid clearing and there are several methods in vogue depending on what material is being drilled. Some factories use air pressure while others depend on a can of kerosene into which the workman can dip his jig from time to time, but all of them provide the workman with a brush to keep the jig clean. Now it is evident if a brush is to be used to keep the locating surfaces in a jig clean it is important to be able to reach these surfaces with the brush. If this is not possible the jig must be made open so that the chips can be washed out as they accumulate. Locating pads or points should be built up above the surface of the jig.

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A simple type of jig is shown at *B* in the upper part of Fig. 23. In this case the work *A* rests on a stud but the walls of the jig surround it so that it cannot be easily cleaned. The designer however, by coring some openings at *C* provides means of washing out the chips without difficulty. In the lower part of the illustration the work *E* is a finished piece which is located on a center stud *F* supported on four points *D*. These points are built up above the surface of the jig so that they

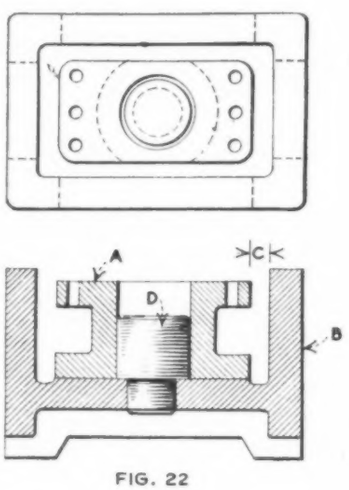


FIG. 22

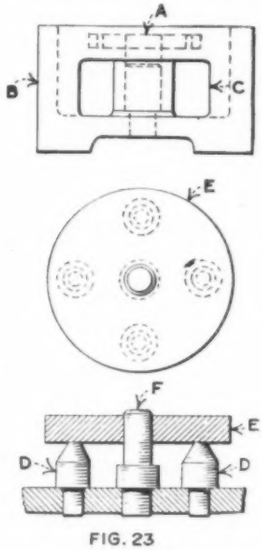


FIG. 23

FIG. 22. CLEARANCE AROUND WORK

FIG. 23. PROVISION FOR CLEANING

will not be apt to accumulate chips and they can also be very easily cleaned. Do not neglect the matter of cleaning when designing a jig.

When jigs are used for a great number of pieces as frequently happens in high production methods, the matter of wear and the accuracy depending thereon must always be considered. Not only should locating points on surfaces be so made that they can be replaced by others when worn, but also the manner in which they are likely to wear should be given attention. An example of this kind is shown in Fig. 24 in which the

work *A* is a finished piece which locates on the stud *C* and rests on the hardened locater *B*. Now if this locater is made slightly smaller in diameter than the work so as to allow the latter to overhang a little all around as indicated at *D*, there is no danger of wearing a pocket or recess in the locating member. But if it should be made as shown in the upper part of the illustration at *E* it is very evident that after a number of pieces have been machined a pocket might be worn in the locater as indicated at *F*. In a case of this kind it would be found that the work might take the position shown at *G* and the inaccuracy *H* would result. The tool designer must always consider these points when designing his jig.

If it were possible to break up the chips when drilling so that they would be in the form of dust there would be very little trouble caused by chips, but as this is not the case suitable provision must be made to take care of them as they are produced. Referring to Fig. 25, an example is shown in the work *A* which indicates the provision which has been made in the locating V-block *B* to provide for chip clearance and cleaning. If this V-block extended down the entire length of the work *A* it would be very difficult to clean out the chips that might accumulate around the edges of it, but by cutting it away as shown the trouble is avoided.

In the upper part of the illustration several examples of bushings are shown. Let us assume that the work *C* is to be drilled. Now if the bushing is placed too close to the work as shown at *D* there is no chance for the chips to work their way out except by coming up through the flutes of the drill and packing into the bushing. It is good practice to make the clearance between the bushing and the work about one diameter of the drill as shown at *E*. Care must be taken however not to go to extremes and place the bushing so far away from the work that inaccuracy may result as shown at *F*. In this case the bushing is so far away from the work that the drill may run off and produce an angular hole as indicated.

A peculiar case in connection with chip clearance is shown in Fig. 26. In this case the work which was drilled was of steel and the chips working up through the flutes of the drill became entangled in the thumbscrew *A* in such a way as to loosen it, thus releasing the work and causing inaccuracy. It is evident that this could have been avoided by making the screw *A* a left-hand screw, but this would not be good practice as a left-hand screw is awkward to use.

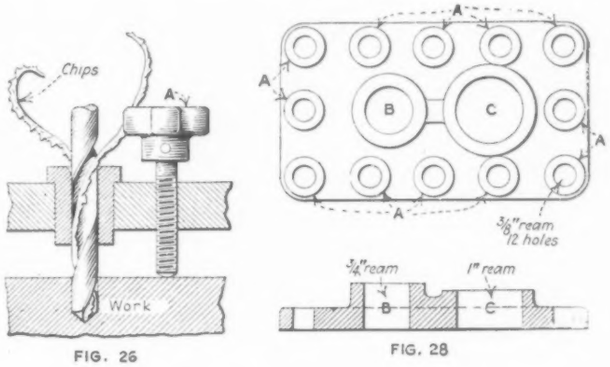


FIG. 26 FIG. 28

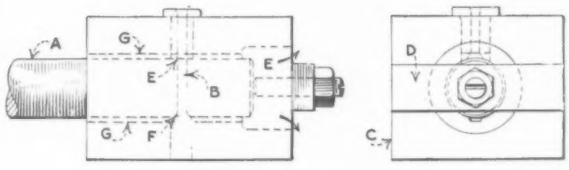


FIG. 27

FIG. 26. CHIP CLEARANCE. FIG. 27. BURR CLEARANCE IN A COTTER PIN JIG. FIG. 28. SIZE OF HOLES TO BE DRILLED IN THE SAME SETTING

A matter which is frequently neglected by young designers is the making of provision for the burr which is thrown up by a drill as it passes through the work. In many cases this can be neglected as there is no burr to speak of on cast iron or malleable iron. It is particularly noticeable however on jigs for small steel pins, cotter pin jigs and the like. An example of this kind is shown in Fig. 27 in which the work *A* is to be drilled at the point *B* and a very simple jig has been made to hold it. The jig is a plain block of steel *C* having a strap *D* across it which contains a stop screw *E* that acts as an end location. Now it will be seen that when the hole *B* is drilled burrs will be thrown up around the hole at *E* and *F* and if no provision is made for this burr it will be very difficult to get the work out of the jig after it has been drilled because the burr will prevent it. The remedy for this is to cut a groove slightly larger than the drill diameter at the top and bottom of the jig as shown at *G*. When this is done the piece can be removed without difficulty. It is not advisable to attempt to drill holes of large and small diameters in the same jig unless conditions are such that the jig is very expensive and it would be costly to make other jigs. In cases of this kind it might be possible to arrange two machines side by side so that the jig can be moved from

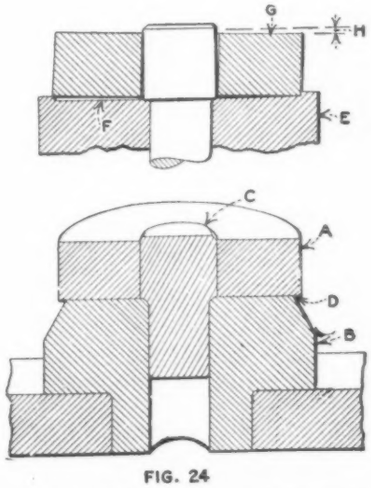


FIG. 24

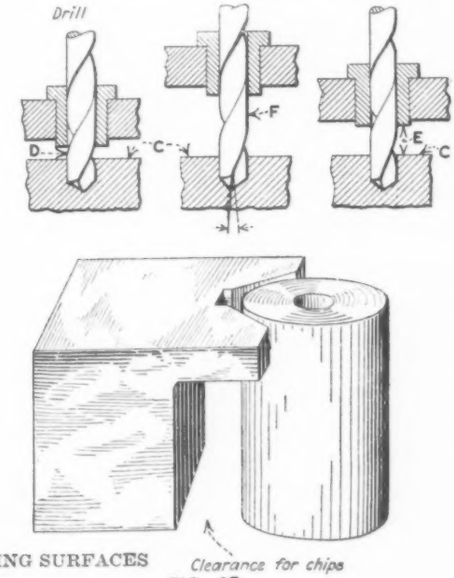


FIG. 25

FIG. 24. PROVISION FOR WEAR ON LOCATING SURFACES
FIG. 25. CHIP CLEARANCE

one to the other in drilling the holes. An example of this kind is shown in Fig. 28 in which there is a series of reamed holes $\frac{3}{8}$-in. in diameter all around the edge of the casting, as shown at *A*. It will be seen that there are also a $\frac{3}{4}$-in. reamed hole and a 1-in. reamed hole in the work. Now, it would be better practice to drill all of the holes *A* in one jig and then to build another jig for the holes *B* and *C*. This point should always be considered by the tool engineer when laying out his operations, but occasionally it is overlooked so that the jig when made is not practical. It happens occasionally that an inexperienced designer will design a jig and after he has worked it up very nearly to completion he will discover (or someone else will discover) that he cannot get the work into or out of the jig. Naturally this is somewhat embarrassing, so that the point may be brought up at this time that it is well for the designer to bear continually in mind throughout the design of his jig that it is necessary to put the work into the jig and to remove it therefrom. Suitable provision should be made so that the operator can reach in and remove the work without difficulty or else an ejector should be provided to take care of the difficulty.

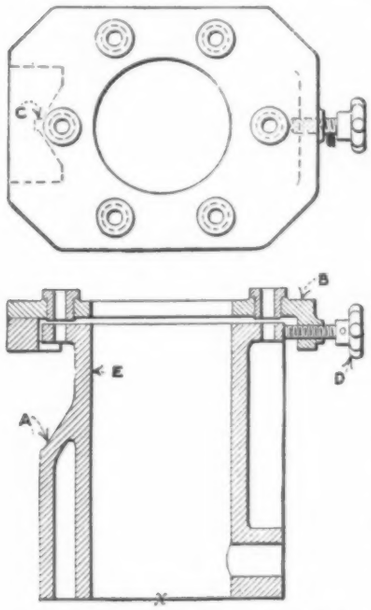


FIG. 29. SET-ON OR PLATE JIG

There are various types of jigs in common use and these will be dealt with in detail in their proper sequence. It is not easy to make a broad distinction between some of the types of jigs, but speaking generally they may be divided into the following: Plate and templet jigs; cast jigs, open and closed; built-up jigs; trunnion and indexing jigs, and standard jigs. A brief discussion will be given of each of these types.

One of the simplest types of jigs is a "set-on" or plate jig, illustrated in Fig. 29. Jigs of this kind are used on heavy castings where one end is to be drilled with a few holes and when the other end is finished so that it can be used as a surface on which to set up the work. In the illustration shown *A* is the work and *B* is the jig. This particular jig is made of cast iron and has a steel V-block located as shown at *C* which is used to locate the jig in relation to a boss on the casting. A thumbscrew *D* is provided at the opposite side in order to make the jig fast to the work and draw it up tightly into the locating block. We might easily imagine a condition in which the hole *E* had been previously machined, thus allowing a plug to be dropped down into the hole to use as a locater instead of working from the outside bosses with a V-block as shown.

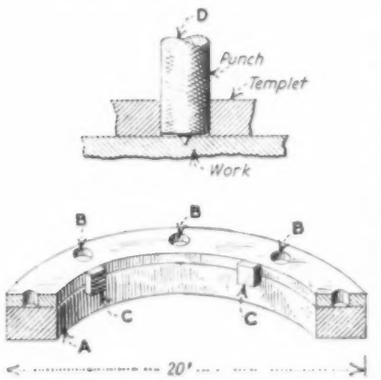


FIG. 30. TEMPLET JIG FOR A LARGE RING

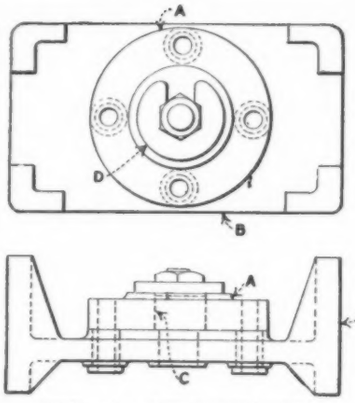


FIG. 31. OPEN JIG TYPE

A templet jig is generally used with a prick punch to locate a series of holes on some pieces of machine work where only a few are required. An example of this kind of jig is shown in Fig. 30. In this case the work *A* is a large ring which has a number of holes *B* drilled in it here and there on the surface of the ring. The templet jig is made of sheet metal and is located in the work by means of several lugs such as those shown at *C*. A special punch like that indicated at *D* is used to mark the centers of the holes by placing it in the templet and striking it a blow with a hammer. After the work has been completely marked the templet is removed and the drilling is done on a drilling machine.

A very simple type of open jig is shown in Fig. 31. Jigs of this kind are used for simple pieces which can be easily clamped and which have only a few holes to be drilled. In the case shown the work *A* is located by means of a center stud *C* and is clamped down by the C-washer *D*. After this has been done the jig body *B* is turned over and the work is drilled from the other side.

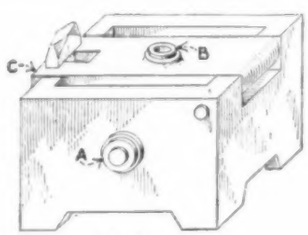


FIG. 32

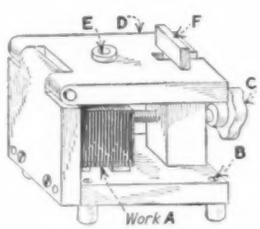


FIG. 33

FIG. 32. CLOSED OR BOX JIG. FIG. 33. BUILT UP JIG

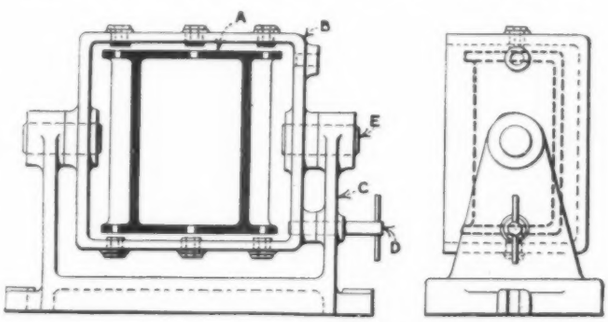


FIG. 34. TRUNNION JIG

The type of jig shown in Fig. 32 is usually termed a box jig. The body of the jig may be all steel or cast iron but in the case shown it is cast iron. Bushings are inserted as at *A* and *B* and a hinge or leaf *C* is

provided which sometimes acts as a clamp to hold the work in place but more frequently it simply provides means for removal of the work after it has been drilled. Jigs of this kind are commonly used for small parts and light drilling.

Fig. 33 shows quite a different type of jig as this is made up of separate pieces of stock which are screwed

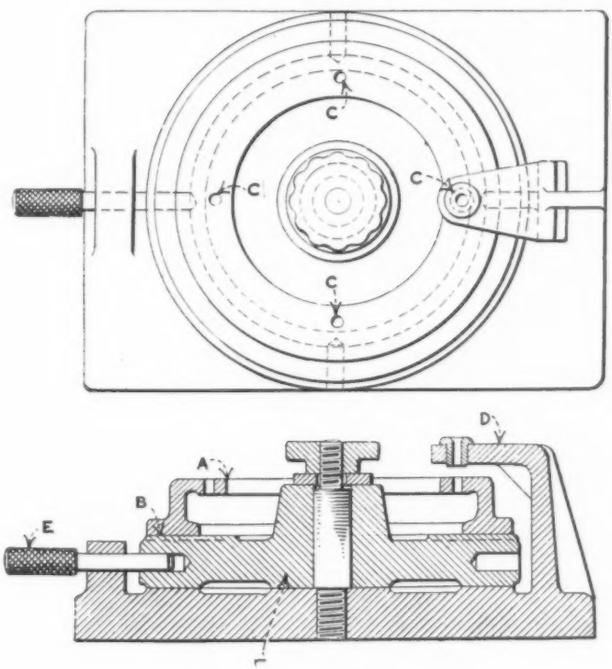


FIG. 35. INDEXING JIG

and doweled together. The advantages of this type of jig are that it can be readily made and that it has many advantages from the viewpoint of replacements when worn. In the particular jig shown, the work *A* rests on the steel base *B* and is held in place by means of the thumbscrew *C*. The leaf *D* has a bushing at *E* and it is located and held in place by the quarter-turn thumbscrew *F*. A jig of this kind can be easily cleaned in addition to its other advantages.

In the drilling of automobile cylinders, transmission cases, housings and many other large castings having holes drilled from several sides and possibly at various angles, a trunnion jig is usually found the most desirable, because after the work has once been placed in the jig all of the holes can be drilled before it is removed and as a consequence correct relation between the holes will always be assured. A simple type of trunnion jig is shown in Fig. 34. In this case the work *A* is located in the crade *B* which in its turn is mounted on the trunnions at *E*. As the various holes are drilled the index pin *D* is removed and the portion *B* is turned over into such positions that the desired bushings come uppermost.

The correct location is assured by means of the index pin which is generally inserted in a bushing in order to insure accuracy. Trunnion jigs are made in great variety and the example shown to illustrate the type is a very simple one.

An indexing jig is somewhat different from a trunnion jig in that the work is indexed into different positions for drilling a series of holes usually through the same bushing. A case of this kind is shown in Fig. 35 in which the work *A* is located by means of some previously drilled holes in the surface *B*. In this case there are four holes to be drilled at *C* and one bushing located in the bracket *D* in the correct relation to the center of the work. A jig of this kind is supposed to be strapped or clamped to the drilling machine table and the work is indexed by pulling it around until the index pin *E* enters the various holes in the revolving member *F*.

Occasionally index jigs are made when two or more holes are close together and a series of these holes is required at equally spaced intervals around the parts. Many methods of indexing are in use and the example shown is a very elementary type. Other instances will be given under their proper heading.

Magnetic Chucks. VI

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

Continued from last week's issue

IN THE multiple-magnet type of chuck instead of one large coil surrounding a main central pole there are individual coils around each core, and as these cores vary both in length and width of section, as well as in the shape (the latter in the case of the rotary chuck) many different sizes and styles of coils are needed.

Coils are wound upon a machine which automatically measures the number of turns of wire in each, so that every coil may have the proper amount, and consequently be of the correct electrical resistance. Enamel-coated copper wire is used instead of wire with fabric insulation, for the reason that it requires less space for a given amount of wire; the size of wire and number of turns depending upon the particular chuck for which the coils are designed. The size of wire, the number of turns in a coil, the thickness of core, and the space between cores, are interdependent factors that must be carefully calculated and checked by experiment in order to assure maximum holding power of the chuck.

Fig. 99 shows how the coils are made to conform to the shape of the magnet cores. This cut shows all the parts (except the wire) of several sizes and shapes of coil. Considering for the moment only the kind of coil for which the machine shown in Fig. 100 is set, we may note at *A*, Fig. 99, the same kind of bobbin. These bobbins (of which there are two or more for each kind of coil) are separable, so that they may be taken out after the coil is wound. The larger ones are made of aluminum and the smaller ones of steel.

The bobbin *A*, Fig. 99, separates along a diagonal line as shown at *BB* which, together, constitute the mate to *A*. At *CC* are shown a couple of arbors for the winding machine by which arbors the two parts of the bobbins are held together and held in the machine.

Girls Operate Winding Machines

Two girls operate two winding machines; one girl handling both machines and the other setting up and taking down the bobbins. Fig. 101 at *A* shows the

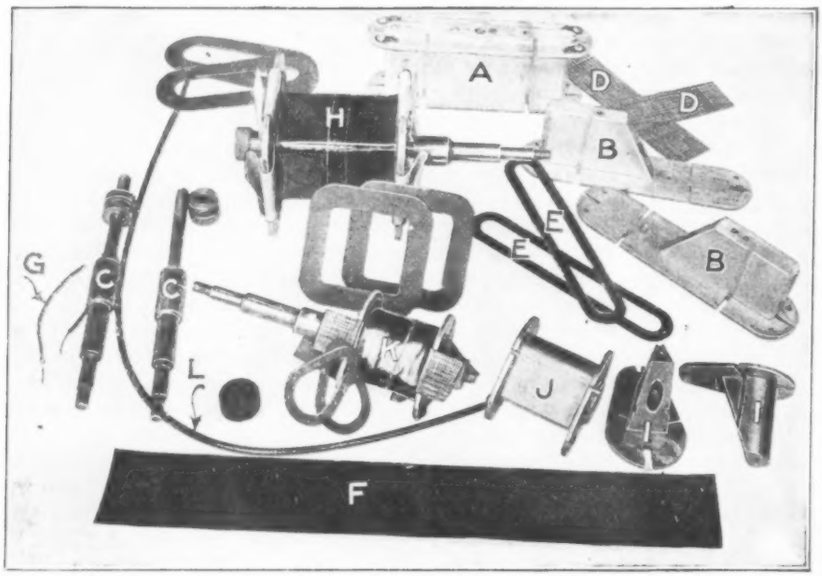


FIG. 99. PARTS OF COILS AND BOBBINS

bobbin *A*, Fig. 99, ready to set up, while in Fig. 100 may be seen the same bobbin on the machine and ready to wind.

To assemble or "set up" a bobbin for winding, the operator takes up one-half *B*, Fig. 99, and lays lengthwise upon it (the shorter way of the bobbin) the two moisture-proof binding strips *DD*. Holding these with thumb and finger of the left hand she slips the two fiber washers *EE* over the binder, fits on the other half *B* of the bobbin, locating it by the dowel pins, and puts the arbor *C* through the bobbin which is then held against coming apart by the round nut of the arbor which the operator immediately screws on. For convenience in handling, the arbor with the assembled bobbin is placed in the post at the end of the assembling bench as shown at *A* in Fig. 101; thereafter leaving both of the operator's hands free for further manipulation.

The binding strips are spread smoothly along the body of the bobbin and pressed sharply down into the corners next to the heads, folded over the latter, and the loose ends caught under spring clips provided on the outside of the heads for that purpose to hold them out of the way during the winding. The fiber washers which are to form the heads of the coil are then separated as far as the length of the bobbin will allow and a strip of varnished cambric, *F*, Fig. 99, is wound around the body of the bobbin and held by a couple of rubber bands.

The machine operator then takes this prepared bobbin, handing over in exchange one that has been wound, and puts it in the machine by turning the arbor into the spindle of the machine which is threaded to receive it.

This operator is provided with a boxful of terminal wires *G*, Fig. 99; short pieces of stranded wire with an asbestos or rubber covering. Near the end of each winding machine, as at *B*, Fig. 101, is a little gas furnace holding a small quantity of molten solder. The winding machine operator scrapes the enamel covering an inch or so off of the end of the wire from the reel on the machine, weaves it into the strands

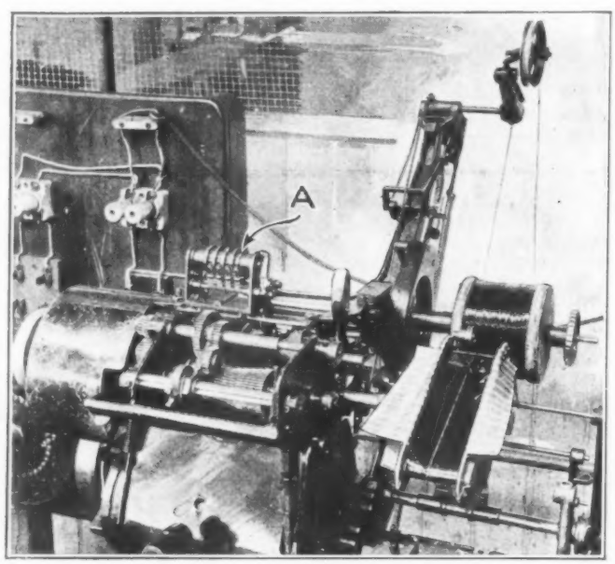


FIG. 100. THE WINDING MACHINE

of the terminal wire and dips the joint in the solder.

Threading the terminal wire through a hole in the fiber washer and a corresponding hole in the bobbin head the operator wraps two or three turns of wire about the embryo coil, takes off the rubber bands, and starts the machine. In the large view of the winding machine, Fig. 100, from which some of the protecting covers have been removed for better observation, may be seen the change gears and the counting device. The change gears are set to allow the machine to make the required number of turns, this number being calculated in advance for each size of coil and based upon the size of wire and the electrical resistance required in the coil.

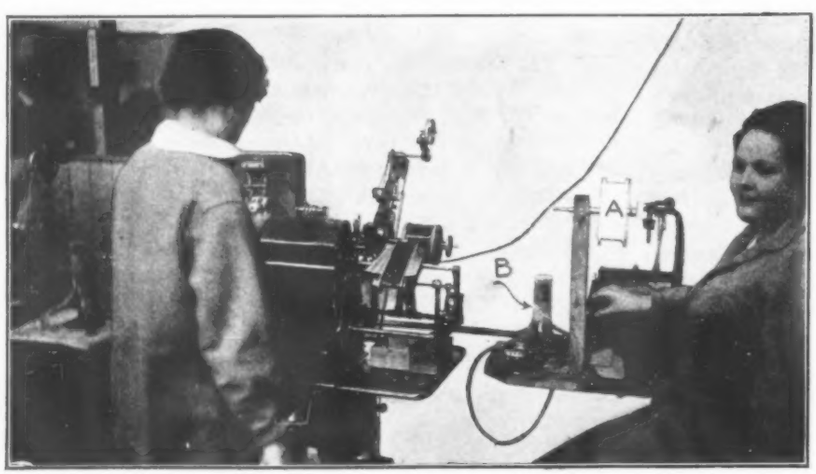


FIG. 101. READY TO WIND A COIL

Before starting the machine each time the operator sets the numbered dials *A* of the counting device to the requisite number of turns of wire. The machine counts off the numbers on the dials as the winding proceeds until zero is reached, when the machine stops.

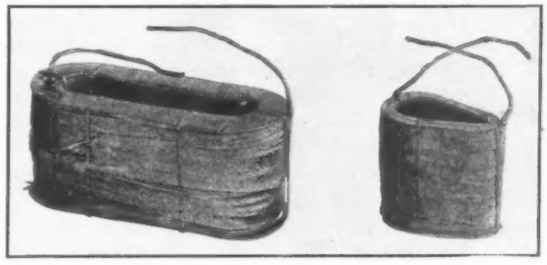


FIG. 102. FINISHED COILS

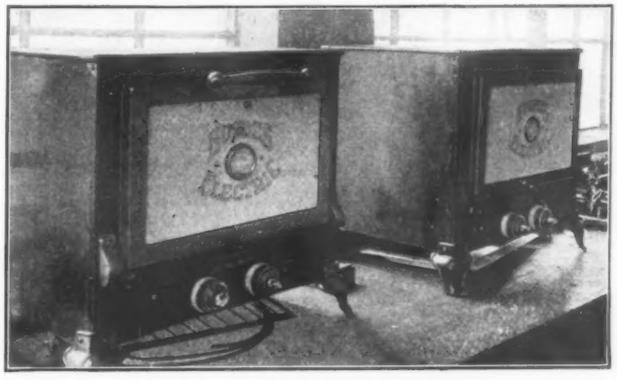


FIG. 103. THE ELECTRIC OVENS

FIG. 104. IMPREGNATING THE COIL WITH INSULATING COMPOUND

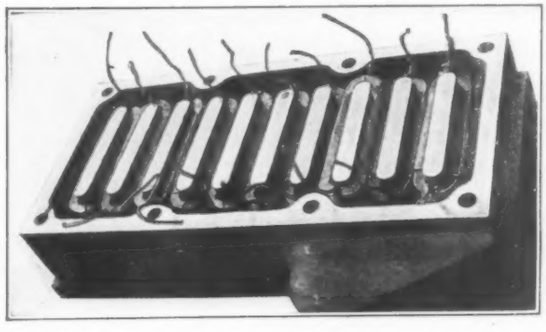


FIG. 105. RECTANGULAR CHUCK WITH COILS IN PLACE

The ends of the binders *DD*, Fig. 99, which it will be remembered were the first parts to go on the bobbins and consequently pass under the wire are then freed from the clips, brought back over the coil, and three or four turns of wire wrapped on outside of them to hold them down. This finishes the work so far as the machine operator is concerned. She cuts off the wire, unscrews the arbor from the machine and hands it over to her companion, who solders on the outer terminal wire, wraps the coil with cotton tape, and takes out the bobbin.

If the coils are small, one machine and two bobbins will keep two girls busy; on the larger coils three bobbins are supplied and two machines are used.

Other bobbins and parts for other coils are also shown in Fig. 99, *H* being a bobbin prepared to wind a coil for the demagnetizer and at *I*, *J* and *K* respectively are the parts and the assembled bobbin used for winding the coils for one of the smaller rotary chucks. In Fig. 102 are two finished coils; one for a rotary and the other for a rectangular chuck.

After winding the coils, they are baked for four hours in the electrically heated ovens, shown in Fig. 103, to expel any moisture that may be in them. They are then impregnated with a moisture-repelling and

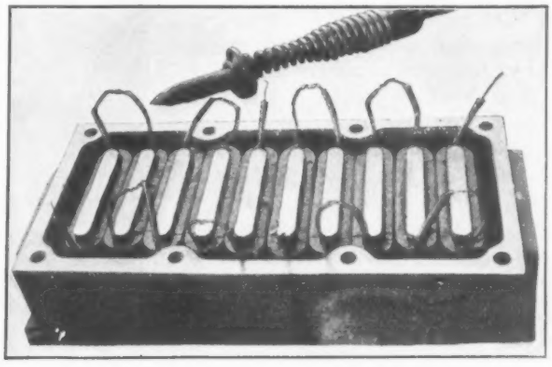


FIG. 106. THE COILS CONNECTED

insulating compound. While hot from the oven they are set in the tank of molten compound shown in Fig. 104 and left until air bubbles cease to form on the surface of the compound, when they are transferred to a draining basket.

Preparatory to assembling the chucks the interior surfaces of the iron body and the cores are given three coats of shellac varnish as an additional precaution against "grounding" or short-circuiting. The coils are set over the cores, taking care that adjacent coils are so connected as to preserve the direction of the electric current. Before joining the terminal wires a piece of tubing made from shellac and cambric, and looking more like a piece of spaghetti than anything else (shown at *L*, Fig. 99) is slipped over every other wire so that when the joints are soldered the insulating tube can be drawn over the joint. In Figs. 105 and 106 are chucks before and after the connections are made.

Coils Arranged for Either 110 or 220 Volts

The coils in all chucks but the smallest ones are joined in two separate series, and four leading-in wires are run to the "volt box" shown in Fig. 107 which is the only outlet from the interior of the chuck. This is done so that by unscrewing the pipe-plug that attaches the outer conductor the resistance of a chuck

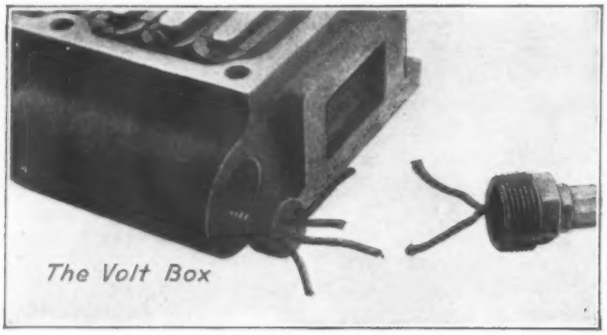


FIG. 107. THE VOLT BOX AND CABLE, SHOWING CONNECTIONS

may be changed to conform to the requirements of a 110- or a 220-volt current supply. In this figure may be seen the four leading-in wires and the two wires from the cable. By connecting one wire of the cable to two leading-in wires and the other cable wire to the other two leading-wires the coils are placed in two parallel groups for the 110-volt current. By connecting one cable wire to one leading-in wire, the other cable wire to another and connecting the remaining two leading-in wires together the two pairs are in series and the chuck is adapted for 220 volts.

This connection must be made understandingly. The leading-in wires are all numbered and any change should be made strictly in accord with the directions. It is possible to render the chuck inoperative on either current, or even to burn out the coils with a 220-volt current if the connections are wrongly made.

The outer conductor is a metal-armored cable impervious to moisture and is sealed into the connecting pipe-plug with an oil-and-waterproof compound. As a test, the Heald chucks have been completely immersed in grinding solution for days at a time, with the current alternating on and off, and when opened were found to be perfectly dry inside.

Finishing Touches Before Closing

Before putting on the top plate, strips of fiber board are placed around the coils between them and the iron, and a sheet of the same material, with openings cut for the cores, placed over them; the whole being then thoroughly shellacked. The object of this is to make it impossible for any part of a coil to come in contact with the iron of the shell or top-plate.

Before and after closing, each chuck is tested for "ground" with a 1,100-volt current from a portable transformer. One terminal from this machine is connected to the shell of the chuck and the other to first one and then the other terminal of the coils. If the milliammeter on the instrument board registers any flow of current the chuck is opened, the defect sought out and remedied.

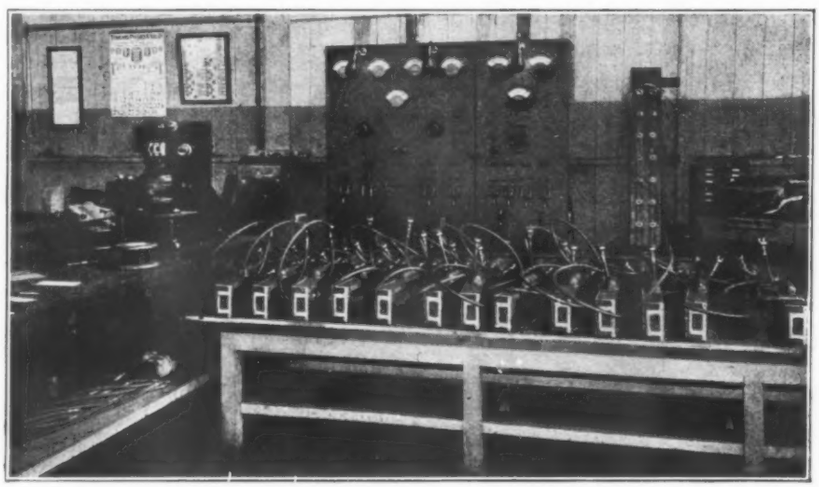
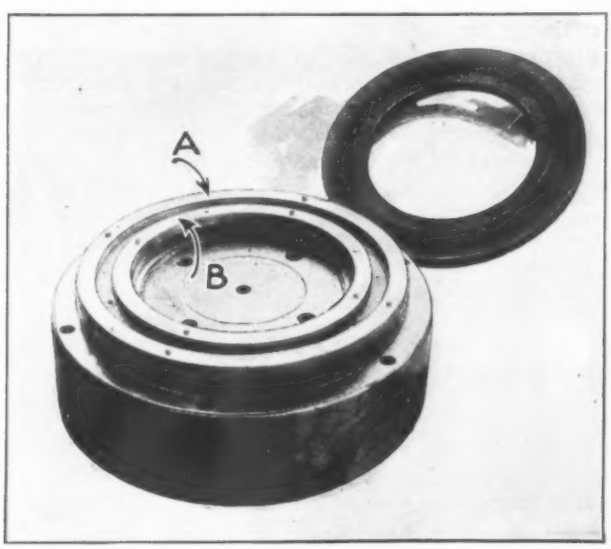


FIG. 108. THE SERVICE TEST; 24 HOURS UNDER FULL LOAD

All chucks made by the Heald Machine Co. are subjected to a 24-hour test under full operating current. For this purpose they are connected up as shown in



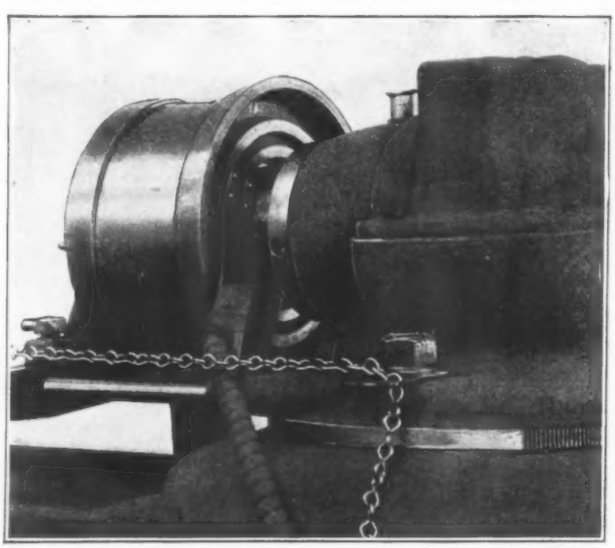


FIG. 109. COLLECTOR RINGS ON ROTARY CHUCK. FIG. 110. SHOWING METHOD OF GETTING CURRENT TO ROTARY CHUCKS

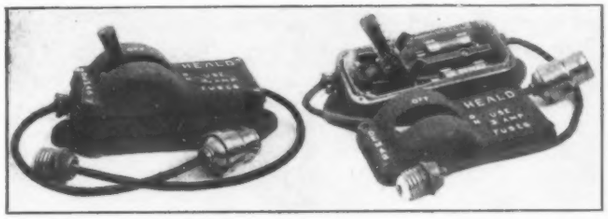


FIG. 111. THE HEALD DEMAGNETIZING SWITCH

Fig. 108 and if at the expiration of the test period a chuck is more than comfortably warm it is sent back to the assembling bench to be opened and the trouble located.

Carrying Current to Rotary Chucks

A current conductor cannot, of course, be attached directly to a rotary chuck. Current must be supplied through a pair of collector rings connected to the terminal of the coils. The back of a rotary chuck with its collector rings is shown in Fig. 109.

A ring of bakelite is attached concentrically to the back of the chuck; this ring having mounted upon it the bronze contact rings *A* and *B*. Bronze studs on the under side of these rings connect with the terminal wires from the coils.

Though the rotary chucks may be connected for either 110-volts or 220-volt current the connections are inside the chuck body and cannot be changed without taking off the top plate of the chuck. It is not advisable to make this change outside the factory.

Current is brought to the contact rings by means of carbon brushes attached to brass springs which act as current carriers and to hold the brushes under a uniform pressure in contact with the rings. Fig. 110 shows the method of holding the brushes on the Heald internal grinding machine. For use on other grinding machines or lathes, special blocks are furnished that can be clamped to a convenient part of the machine frame.

Wherever magnetic chucks are used it has been found expedient to install a pole-changing, or "demagnetizing," switch, to counteract the tendency of the magnetic surface to retain a portion of its magnetism and thus make it difficult to remove small pieces.

The Heald Co.'s demagnetizing switch is shown in Fig. 111. An iron case contains the switch contacts and cut-outs mounted upon a bakelite support and insulated from the iron casing by strips of fiber. A rib of the bakelite extends the whole length of the switch, separating the part of opposed polarity and lessening the liability of accidental short circuit. Being entirely enclosed, there is no possibility of the operator coming in contact with current-carrying parts.

Unemployment

Individual Barter in Goods Not Practical—Standards of Living Regulated Solely by Production—Equalizing Production the Only Remedy for Unemployment

By JOHN S. WATTS

THERE would seem to be need for clear thinking on the subject of unemployment, its causes and possible remedies. That this is so, a perusal of the discussions on this subject in the daily papers and among the people generally, will prove.

For example the commonest criticism heard is, that while there are tailors out of employment in, say, New York and needing shoes, there are at the same time, shoemakers walking the streets of Lynn and in need of clothing. The question is then asked, with an air of deep wisdom, as to why should not the idle tailors be set to work to make clothing for the shoemakers who will pay for them by making the shoes required by "the party of the first part," as the lawyers say.

At the first glance this proposal seems to contain the germ of an idea, but looking into the matter a little deeper we find that it is not to be remedied quite so simply as that.

The main idea, in the minds of those suggesting the above and similar remedial measures, seems to be that scarcity of money is the cause of unemployment, and that therefore, if we revert to the old custom of trading by barter, we avoid the necessity of using money, and it becomes simply a matter of filling ones own wants by supplying the wants of others, which as the bulk of the population are always wanting something or other, should not be difficult.

Now let us examine the feasibility of this proposal by imagining the procedure which would have to be gone through to carry it into execution. Granting the possibility of the shoemakers and tailors arriving at an agreement as to the terms of the barter, we will assume that a contract has been made between the two parties, and we will follow the fortunes of the shoemakers in their attempts to fulfill their end of the bargain.

The first thing to do would be to purchase or rent a shoe factory, which in accordance with the rule of trade by barter, would have to be paid for in either one of the two articles being traded in, namely shoes or clothing. As the proprietor of a shoe factory is necessarily familiar with the sale of its product, it is possible that one could be found to agree to some arrangement by which he would be paid in shoes. At any rate we cannot say that some such agreement is outside of the bounds of possibility.

Supposing the factory to be available, it now becomes necessary to arrange for the supply of leather or whatever material it is that they do make shoes of. I am using leather for the purposes of this example, but am open to correction as its actual use in the manufacture of shoes. Sometimes, in wet weather, I feel in my "sole" that my shoes came from pulp and are returning to pulp.

The supply of leather, then, together with coal or electric power, taxes, packing, shoe findings, freight, and the thousand and one other things that will be needed, must be paid for by such makers of each article as are willing to accept shoes or clothing in exchange for the same.

To merely state the case is to show the fallacy of the whole thing, as even if it could be arranged, consider the amount of time and expense incurred in finding

manufacturers willing to take a contract on such a basis, and the endless trouble in arriving at the relative values in shoes of each of the articles required.

Imagine making a pair of shoes to fit the postmaster in order to obtain a supply of stamps, and how long would the stenographer work for a steady salary paid in shoes.

It may be contended that a part of the output could be sold for money wherewith to pay for these articles, but if this could be done, the shoemakers would have been employed making shoes for money and not have been idle as in the case we are supposing.

Trade by Barter

Having concluded that trade by barter does not hold out any prospects of being able to ameliorate the unemployment, we proceed to state the general outline of the state of affairs in an effort to clear the case of unimportant issues, and bring out the underlying basic causes if possible.

The symptoms are that the state of the demand for labor varies in recurring cycles, from a maximum of unemployment, to a maximum of employment of labor, the period of time elapsing between one maximum and the next being approximately five to seven years.

That these fluctuations of employment are not due to any variation in the total supply of labor, will not be disputed. In actual fact, on this continent, we are favored somewhat by a floating population, which in times of unemployment will generally relieve the situation to some extent by returning to Europe and there await the return of better times.

The period of maximum unemployment is always accompanied by, and usually forecast by, what is known as a scarcity of money, but which would be more truly named as a scarcity of credit.

The greater the boom in any one cycle, the greater will be the depression following, the action being analagous to that of a pendulum which swings as far to one extreme as it did to the other, from which we may judge that if we could arrive at a happy medium, and hold to it, we would damp down the fluctuations till we struck a normal steady demand for labor.

In bad times we have men anxious to work and in need of goods which other men have and are anxious to sell, but in the nature of things, as at present constituted, the sale must be for money, while the out-of-work can only offer labor.

Over-Production

The merchant, not being able to sell his goods, ceases to order from the manufacturer, and he in turn cuts down his production to meet the falling demand, and so increases the unemployment and hastens the collapse of business in general. This condition is sometimes loosely termed over-production, but in the case of necessities, at any rate, it can hardly be said while part of the people are occasionally in want of them, that there has ever been over-production of necessities. In the case of luxuries, it is easily possible to have over-production. In fact until the whole of the people willing to work for them have sufficient necessities, all production of luxuries is over-production, or at least production of the wrong class of material.

The above I think covers all the principal symptoms of the disease in our corporate body of fluctuation of employment, the minor symptoms not mentioned being off-shoots or consequences of the principal symptoms.

Investigating now the conditions under which we live and work, and which conditions must necessarily be the cause of the disease, or more correctly, some part if not all of the conditions, we can assert the following postulates as needing no proof, being obvious.

For any given population, with average crops of grains, vegetables, cotton, wheat, etc., there is an average standard of living which cannot be exceeded, no matter how much money there may be in circulation, unless there is a surplus from previous years.

The average standard of living cannot be higher than that fixed by the average production over a number of years. That is, if we use up all of the production of the fat years during those years, our standard of living cannot be so great during the lean years.

With the natural increase in knowledge and skill, and the increased wealth in the form of machinery of production of each generation over the preceding one, we have the ability to increase the standard of living in the future up to the limit imposed by the possible productiveness of this earth, which limit is so far away that we need not consider it.

If for any reason a part of the population fails to put forward its best efforts in producing, the standard of living must be reduced below what is possible by the amount of the produce so lost.

Intensive Methods

Under the existing intensive methods of production, it is hardly possible for the worker to be skilled in the making of more than one class of article, and if through inefficient leadership, too large a percentage of the workers are trained in the manufacture of any one article we will have more than enough of that article, and a corresponding deficit in the supply of some other article, which could have been made by the labor of those who produced the surplus of the first article. Bear in mind that not only is the surplus of no value, but it is the cause also of a waste of the material and labor entering into its manufacture.

To return to the example of the tailors and shoemakers, the real reason why the demands of these people cannot be satisfied, is that having both produced more of their work than is actually necessary, the rest of the population refuse to give them the money (credit) necessary to supply their wants until this excess of production is absorbed. The remedy mentioned in the beginning of this article, even if it were feasible would make matters worse, as it would add to the already excessive supply of both shoes and clothing.

The remedy then for unemployment is that the requirements of the whole population be carefully estimated; that the production of each and every article be exactly equal to the demand, and that the numbers of the workers in each trade be adjusted to suit the desired output of that trade.

This is admittedly a formidable problem, but I believe not beyond our ability to solve, and in any case it is better to have some plan to strive for than to continue in the happy-go-lucky way in which we are going. We may as well face some of the difficulties which will be incurred in an attempt to balance the production with the demand, and the first that occurs, is that it will involve some form of governmental control of our industries, in so far at least as the control over the starting up of new factories for producing articles, the demand for which is met by plants already in existence.

All governments are notoriously inefficient in the

operation of any business entrusted to their care, but that this need not be so is shown by the fact that large companies owned by a numerous body of share-holders and operated by them through a board of directors, can be and are well managed, and if similar methods were used in the business of governing, similar results should be obtained, as the governing of a large corporation on behalf of a large body of share-holders is not unlike the governing of a people on behalf of the same people. It would be a considerable step forward if the governments simply collected the statistics necessary to strike a balance between the demand and production, and acted only in an advisory capacity.

Supply and Demand

It may be contended that to prevent the erection of a new factory because existing factories could supply the demand, would tend to discourage the bringing out of new ideas and improvements. This would not occur, because with the natural growth of the population the demand would increase and would naturally gravitate to the most efficient plant.

On the other hand, let us see what happens at the present time. Some man, or body of men have a "hunch," it can usually be said to be nothing more than that, that there is an opening for a factory to make a certain product. If they fail, they have used up considerable material in buildings, machinery, etc., which is a loss to the community and have trained up workers to do work which is not required.

If this new factory succeeds, it does so at the expense, probably of the older ones by taking part of their business away from them, and so causing unemployment among the workers of the older companies. All of us know of cases where men have worked for companies for years, have built and paid for their own homes by the thrift of a working lifetime, only to lose them at the end through the closing up of the place they worked through no fault of their own. Bear in mind that the loss in such cases is a loss to the community as well as to the man, in that the material and labor entering into the construction of the employees' homes, are deducted from the available wealth of the community and have to be duplicated in whatever place the discharged employees move to find new work.

Another remedy suggested for unemployment is to reduce the number of working hours per day, and while this will result in the employment of greater numbers, it will also reduce the standard of living by reducing the available production for division among the people.

The Value of Money

There are still some who call themselves Socialists, although they know little of the subject, who claim that if everything was divided up equally all would have enough. A few minutes of arithmetic would prove to them that if all the goods of the few wealthy were divided among the many who are not wealthy, the gain to themselves would be too small to be of any benefit. To take away the money of the wealthy would not in any case increase the real wealth of anyone, as money of itself is of value only when goods are produced to be purchased with it, and a redistribution of money would not increase the available quantity of the necessitiies of life. Moreover, money held in large amounts is of much more value if put to use in providing employment than would be the same amount split up among a large number of people. Not that I am defending the acquisition or ownership of large fortunes, but that their confiscaton for redistribution is not of necessity the cure for poverty.

To summarize our conclusions the cure is: For the leaders to direct labor to work which is required, and only to that which is required; for labor, and when I speak of labor I mean both manual and mental labor, to work to its full capacity, both in effort and intelligence; for the population as a whole through its government, to see that each worker receives compensation equal in value to his production or in other words, a fair and equal distribution of the total production.

If this can be compassed, we can have a certain standard of living for an eight-hour day much above our present standard, because of the increased production that will be possible when labor is continuously employed in the making of goods that are really needed, or a lower standard for a shorter day, as may seem good to the people.

Wet Grinding a Dangerous Occupation

That grinding and polishing by the wet process, instead of being, as has been generally supposed, a dustless and innocuous process, is, under certain conditions, a dusty and exceedingly dangerous employment, seems to be demonstrated by a report prepared by Dr. W. Herbert Drury, of the U. S. Public Health Service, after an exhaustive investigation conducted in a large axe factory in a Connecticut town. Dr. Drury shows that the death rate (1900-1920) from tuberculosis among the workers in the grinding and polishing shops, who for six hours a day breathe an atmosphere of relatively high humidity heavily laden with acutely angular hard siliceous dust, is 19 per thousand; and that of other workers in the same mills (but not in the grinding or polishing shops) is only 1.6. Furthermore, the rate in the general population (not including the mill workers) in the three villages from which the workers are drawn is 1.2, and in the whole State of Connecticut is 1.5 per thousand.

The results of the present study are somewhat complicated by the fact that the grinders are without exception foreigners, mainly Poles, Slavs, and Lithuanians, while the polishers and the other employees of the mills are mainly Americans. The grinders have always been noted as hard drinkers, most of whom have regularly gone from the mills to saloons in their damp clothes to drink for several hours. The other workers have lived in characteristic American ways. These differences, however, though important, are not thought to account for the enormous differences between 19 and 1.6 in the death rate per thousand. Moreover, alcoholism is a well-known consequence of work in a dusty atmosphere irritating to the mucous membranes rather than an independent cause.

Pulmonary infections other than tuberculosis show 4.3 deaths per thousand among polishers and grinders as against 1.7 per thousand among other mill workers.

It was not practicable to subdivide "polishers and grinders" into "polishers," "dry grinders," and "wet grinders," and to obtain separate figures for each. It is well known locally, however, that the death rate of the wet grinders is much higher than that of the others.

Counts show that there are an average of ten times as many dust particles in wet as in dry grinding shops, and the report recommends the substitution of a dry grinding process properly protected by the installation of exhausts for the present wet process.

The Steel Works of Czecho-Slovakia

Special Correspondence

THE changed geography of Central Europe has placed the Poldi Steel Works in the new country of Czecho-Slovakia. This plant is near Prague in the Bohemian district, which is especially rich in mineral deposits, particularly coal and iron. The ancient town of Kladno is located in the center of the mining district and for this reason was selected many years ago as a site for iron and steel work. The industries of this section grew year after year and from these small beginnings the Kladno Plant of the Poldi Steel Works was developed.

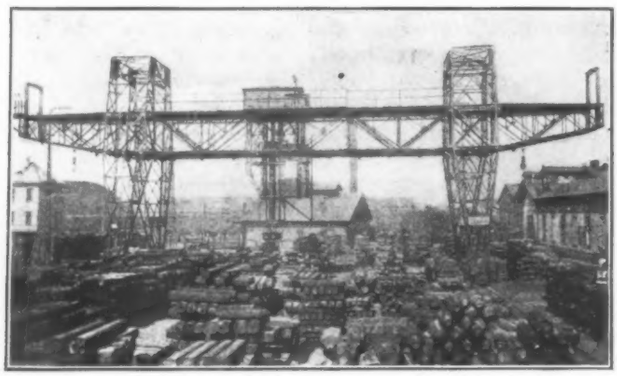


FIG. 1. THE STORAGE YARD AND ITS GANTRY CRANE

In the beginning the steel plant contained only crucible furnaces and various mechanical departments for the manufacture of bar steel and forgings. Strong competition was encountered until an engineer of wide experience, Pazzani by name, became identified with the works and in time became its head. He realized that the only possibility of meeting competition was to concentrate on the manufacture of high-grade steels and every employee was taught and trained with this in view.

The Kladno works is approximately fifty years old and in 1916 it became necessary to enlarge the output, so another plant was built at Komotau, near coal mines owned by the Poldi company. Additions and improvements were also made at the original plant so that both now contain only modern equipment of electric and openhearth furnaces, hydraulic presses, large steam hammers, and electrically controlled mills with complete installations of annealing and heat-treating departments. In addition to supplying high-grade, low-carbon steel, carbon tool steel, high-speed steel, alloy steel, cold-drawn steel and hot-rolled or hammered steel, from small drill rods to large forgings, the Kladno plant also has a large spring-making department for both railroad and vehicle springs. Both plants are equipped with modern chemical and physical laboratories.

The headpiece shows a general view of the Kladno plant, employing about 3,000 men, which is less than half the number employed during the war. This plant now has five basic, openhearth furnaces with an aggregate capacity of 46 tons, one 15-ton electric induction furnace of the Frick type, one Kjellin induction electric furnace of 4½ tons capacity, and a small testing furnace of the same make with a capacity of 250 lb. The

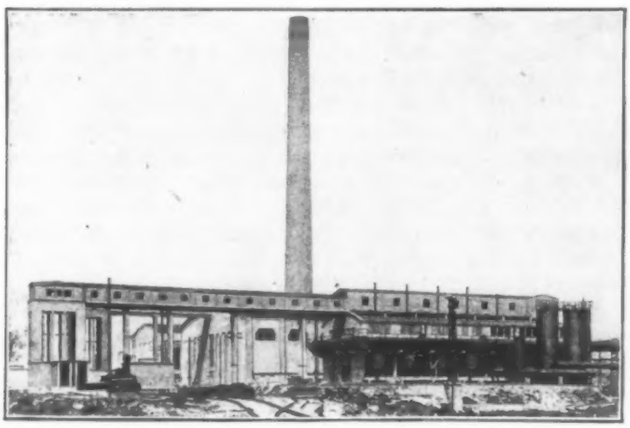


FIG. 2. GAS PRODUCER HOUSE AND COAL CONVEYOR

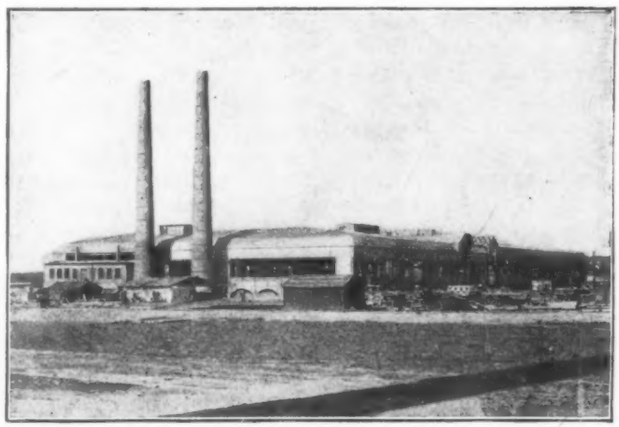


FIG. 3. THE ROLLING MILLS

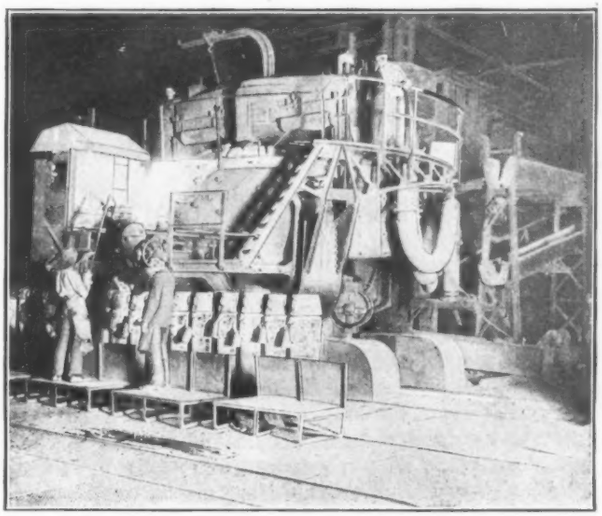


FIG. 4. ONE OF THE LARGE ELECTRIC FURNACES

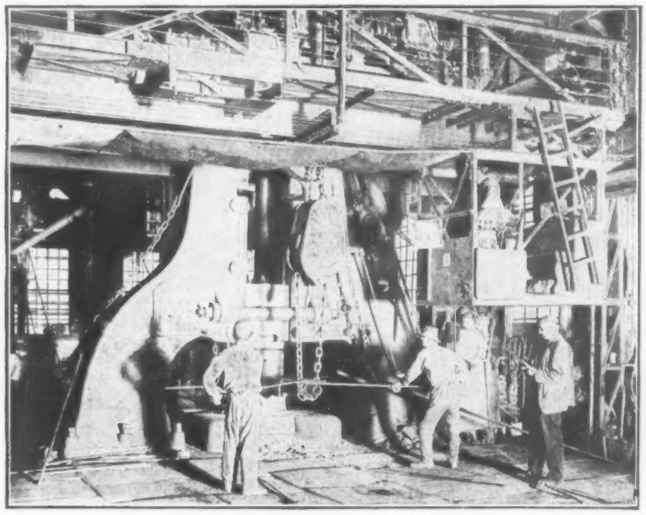


FIG. 5. HYDRAULIC FORGING PRESS AND CRANE

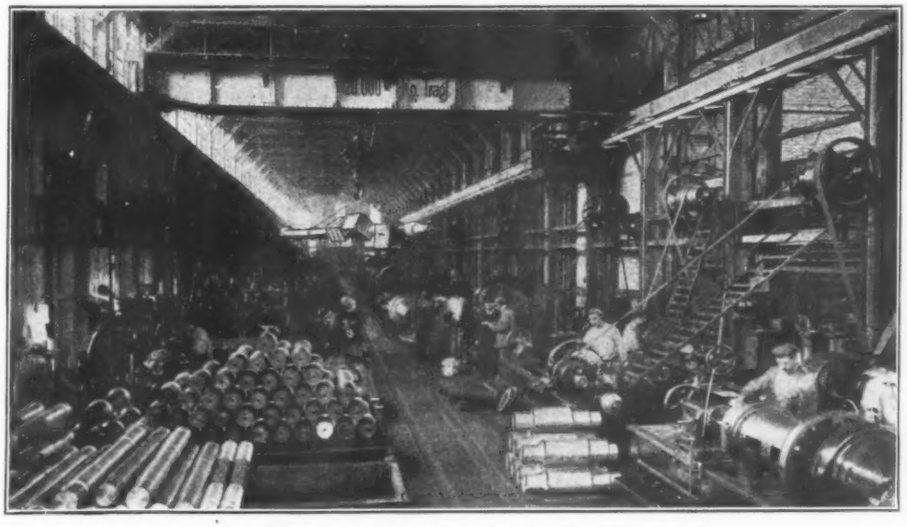


FIG. 6. ONE OF THE BAYS IN THE MACHINE SHOP

Komotau plant has basic openhearth furnaces of 34 tons capacity and an electric 4-ton induction furnace of the Rochling-Rodenhauser type. The openhearth furnaces average five heats in 24 hours and the electric furnaces from nine to ten heats during the same period.

The Storage Yard

The arrangement of the storage yard is shown in Fig. 1, which also shows the large gantry crane equipped with a lifting magnet apparently operated by a hydraulic plunger. Figs. 2 and 3 show respectively the gas-producer house and coal conveyor, and the rolling mills of the Komotau plant. The concrete construction of the gas-producer house is particularly attractive. The Frick electric furnace at the Kladno plant is shown in Fig. 4, comparison with the men at the left giving an idea as to its size.

Coming to the forge department, Fig. 5 shows a hydraulic forging press of 1,200 tons capacity at the Kladno plant, which also has a 400-ton press and 40 steam hammers varying from 165 lb. to 6 tons capacity. The Komotau plant has three hydraulic presses ranging from 500 to 2,500 tons capacity and two steam hammers of 550 and 3,500 lb. respectively. It will be noted that the crane shown in Fig. 5 is 5,000 kg., or approximately 11,000 lb. capacity. In addition to this there is a drop-forge department well equipped with drop hammers, screw-driven forging machines for heavy crankshafts, crank presses, heading machines, extruding presses for tubes and rings, and cold metal stores.

Attractive Shops

Two views of the machine shops of the Kladnau plant are given in Figs. 6 and 7, and show entirely different types of shop construction, the shop shown in Fig. 7 being particularly attractive

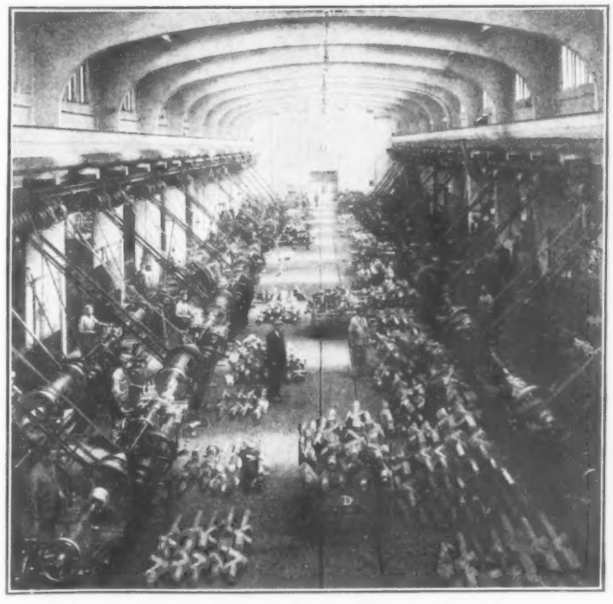


FIG. 7. THE CRANKSHAFT DEPARTMENT

with its arched ceiling beams and roof. Axles, crankshafts and pinion gears seem to predominate in the shops shown in Fig. 6, in which may be seen a traveling crane of 44,000 lb. capacity. It will also be noted that the lathes and other machines are arranged in two rows so as to be readily driven from countershafts arranged directly under the crane ways. The method of guarding the driving belts is shown at the right in Fig. 6.

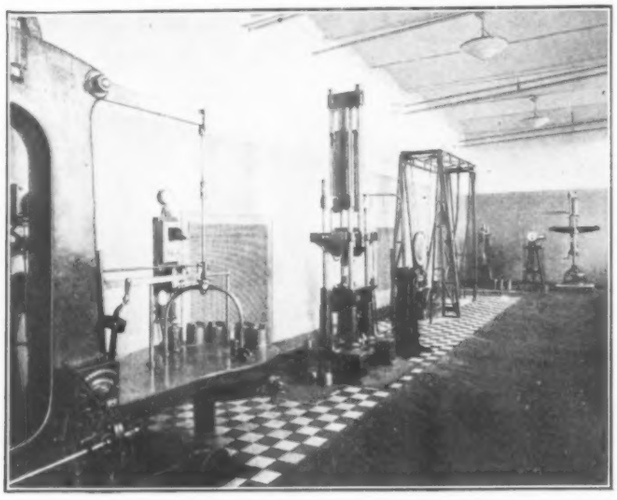


FIG. 8. IN THE PHYSICAL LABORATORY

A like method of machine driving is shown even more clearly in Fig. 7, which also shows the belt guards and the use of the shop railway, a turntable being seen in the distance. This department is devoted entirely to crankshaft work and it will be noted that the lathes at the left are equipped with a special barrel-shaped form of chuck for holding the crankshaft so as to present the desired pin or bearing to the cutting tool. The machine equipment comprises over 800 machine tools of various types.

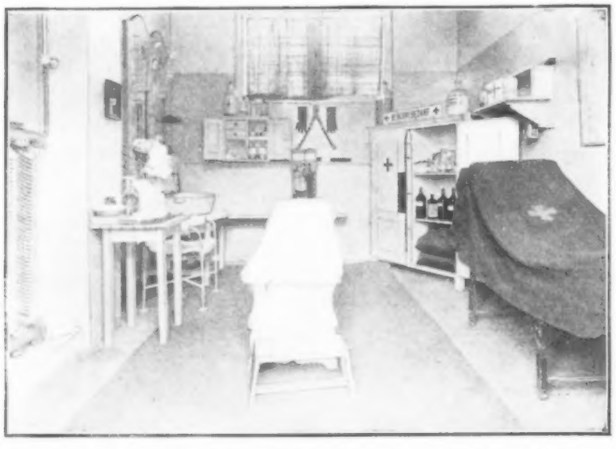


FIG. 9. ONE CORNER OF THE FIRST-AID ROOM

The plant has a well-equipped physical and chemical laboratory, a partial view of the former being shown in Fig. 8. Ample provision for accident cases is made, a portion of the hospital being shown in Fig. 9. There is also a dining room with a capacity for feeding 4,000 people. Shower baths and similar sanitary conveniences are likewise provided.

As the future of all countries, and particularly those which have seen the stress of the great war, depends upon production in the various industries, Czecho-Slovakia is fortunate in having plants of this kind within its borders. Steel mills with a melting capacity of 8,000 tons per month and plants which can finish 4,500 tons per month are a decided asset to a small country.

For Whom Is Education?

BY ENTROPY

The personnel department of the army found as a result of the immense number of intelligence tests which it made that the average member of our forces had a mental age of about 13 years. That is, the average man's intelligence was somewhere about half of that which any except the abnormal can attain. This is further borne out by the fact that the average soldier had gone only to the sixth or seventh grade in school. We have always looked on this short period which boys and girls spend in school as something to be deplored, we have worried over it a great deal and wondered if the country were going to the dogs on account of it, but we have also looked on it merely as showing how little boys were willing to accept the opportunities which were open to them. It may be that these figures from the War Department will open our eyes to certain deficiencies in our public school systems, and especially so as to the education and training of the men who are doing and will continue to do the work in our shops. The average in the army cannot be far different from the average in our shops. The army was recruited by the most impartial means possible, and while we try to sort out men and put them in the places in industry for which they are best fitted we have to realize that when business is good they all have jobs and that the process of selection means simply that one shop may make a good selection, but that another shop has to accept a poor one.

First let us see just what an intelligence test shows. Briefly and somewhat loosely it shows capacity for learning, either by experience, from books or by precept. It does not show, or should not, how much a man knows, but rather how much he absorbs of what is placed before him. It tests his receptiveness for new ideas, his memory for new things, his ability to associate ideas, etc., rather than his having learned things in the past. It differentiates sharply between the man who learns easily and forgets and the man who learns slowly and retains his knowledge, always in favor of the former. When a man has the mentality of a twelve-year-old child it means that he has only the capacity to remember, reason, and associate ideas which a child of that age has. He cannot do much thinking that could not be done by the child. It does not mean that he has the habits of a child of that age and it does not mean that he has only the knowledge of the child. Such a man may learn to do many things which we would not expect a child to do because by long experience he may have found that it is necessary for his own comfort and safety to do things that way. Experience, in other words, does not enter into intelligence as tested in this way.

Now let us see what the school does with its pupils. First and most important of all it constantly presents new ideas. It gives little time and comparatively little drill to pound home those ideas. An educator says that an idea once understood is taught and that repetition beyond that point is not education. The man in the shop learns by doing a thing the way he is told and after a

time that way of doing the thing becomes a habit. The habit is a good one so long as that is the best way to do things, but in the course of progress it becomes a bad habit and one hard to break as soon as a new and better way is discovered. In school the real attempt is to teach people to think for themselves. If the pupils are not endowed by nature with intelligence they can only be taught to think to a limited degree. We are having rather a hard time to convince ourselves that men are not created equal so far as thinking power is concerned, and yet we are confronted by that fact at every turn. It is not the fault of any school that one pupil's quickness of thought and ability to reason are greater than another's. The fault is that schools, both public and industrial, are not organized to do the greatest possible good to the pupils whom they get. That is, the boy with a twelve-year-old mentality goes to school until he reaches the sixth or seventh grade and then he stops almost automatically. He simply cannot do the work of the next higher grade because of his limitations. He may be able to do it, but not at the pace that the other and so-called normal pupils follow readily. If there is pressure at home he may go the second year in each grade and absorb knowledge which he would not get if he had to keep up with the class, but the fact that he goes further does not prove that his mentality is improved thereby.

Now there is a great deal of useful knowledge that is not taught in the first seven grades in schools. The boy who leaves at that time gets it by hard knocks and bitter experiences. It is a very wasteful and inefficient process, which would be unnecessary if our schools were better organized. The boy who goes into an office and always gets his messages mixed learns by being fired from one place after another. He could have been taught in school, but only by slowing down the pace. The girl who never could spell in school does learn in the office, but only as a matter of habit. There are a great many fairly good stenographers who cannot write a letter in longhand and spell it correctly, because the letters do not look the same as in type and she does not recognize her errors.

Rate of Progress Individual

Even our apprentice schools and vestibule schools are apt to be sinners in this respect, especially if they are handled by men who have taught school, in that they set a pace based on the teacher's own mentality, which is usually fully up to normal and therefore about twice as stiff for the average pupil as it should be in order that he may get the greatest good from the work. Each pupil or apprentice has a rate of progress almost as fixed in his case as the rate of vibration of a pendulum, and yet we try to make them all conform to a fixed and arbitrary rate that fits only a small fraction of them closely enough to be considered efficient. Or to put it another way, in the effort to cut down the expense of teaching we make a teaching machine that is adapted to the really best interests of only a small fraction of the material which is fed into it. What if we built a screw machine that would work to advantage on only one bar of steel in ten? We would land in the bankruptcy court. Our schools do no better.

So far we have dealt with speed of learning. There is another more important element. Many can learn to imitate who never grasp the reason why. Take even very bright men, college graduates if you will. Ask them how far they understand mathematics. The answers will vary. Some do not understand algebra, some balk at analytical geometry and most of them will admit that they never understood calculus. And yet all of them made passing marks in all these subjects, but purely on their memory. The method of testing knowledge used in school does not determine so much whether the pupil understands as whether he knows certain words and formulas. A man in the shop may have a most excellent faculty for telling whether or not his cutting tool is running at the best rate of speed and yet not be able to compute its actual speed at all. He gets this sensitiveness through habit, not reason. When high-speed steel came along a great many old-time mechanics simply could not tune themselves up to the new speeds and had to fall back on instructions to "run it on the third step of the cone" and so on until the new habit became a fixed one. On the other hand the man who understood the reason why could figure it out for himself and immediately rose to the situation.

The Best Teacher

So here we have a distinct problem of reducing knowledge to such terms that it can be absorbed by the men who need to have that knowledge. It would seem that the fact that a man had been a college professor makes it very unlikely that he could get down to earth and reduce these things to such simple terms that they can be learned by the rank and file. Part of being a college professor has consisted in the past and probably does now in building oneself a pedestal and climbing up on it. The best professor is the man who can display the most erudition, and by that we mean the most knowledge that the fewest people can understand. The best teacher is the man who reduces the reasoning necessary to understand a subject to its lowest possible terms. A great many things can be taught to a man of low mentality if the teaching is tempered to his condition. The mere fact that he is of low mental age does not debar him from learning a great many useful things, and things which make him a good producer, provided only that he is given time enough to absorb what is put before him, enough practice to make the use of the knowledge habitual and that the thing is put before him in a way that makes it easy for him to learn it. We must teach for the purpose of imparting knowledge rather than for mental gymnastics.

Why Recovery Is Slow

Recovery is delayed by several unsettled factors. These include, in about the order of their importance: (1) The uncompleted liquidation of labor; (2) the unexpectedly poor showing being made by the railroads under the Esch-Cummins law, and apprehension over impending labor developments; (3) tardiness in reducing prices by numbers of basic industries; (4) unforeseen delay in starting machinery to extend credits to foreign purchasers; (5) retention of high money rates for a period almost without parallel in our financial annals; (6) the failure of the retail trade, as a whole, to lower prices commensurate with the drastic declines in wholesale prices; (7) acute dissatisfaction in responsible circles over tax burdens and the absence of any definite plan in Washington to effect thoroughgoing reform and economy; (8) tariff uncertainties; (9) Germany's refusal to meet the Allies demands and the new outbursts of rebellious lawlessness by "Reds." Nevertheless, things are slowly getting better, not worse.—*Forbes Magazine* (N.Y.).

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

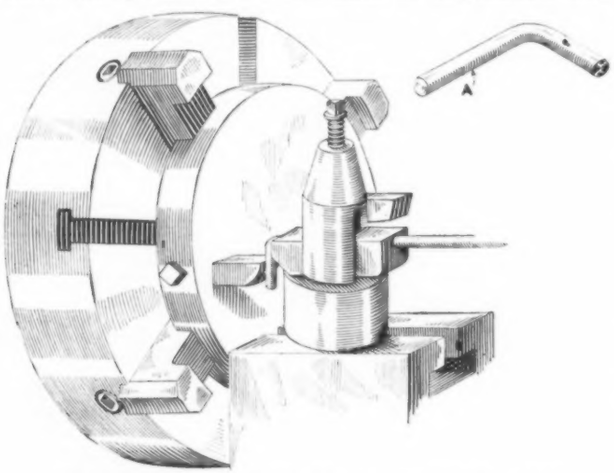
Bending and Cutting Off Wire in a Lathe

By Harry Moore

The sketch shows a unique method of bending and cutting off the piece shown at *A*; original so far as I am aware.

Having several thousands of pieces to make from ⅛-in. wire stock and only a jobbing shop equipment to do it with, the lathe was rigged up in the manner shown. Two short pieces of square tool steel were turned at one end and a flat filed on; next a piece of round stock was procured and drilled at opposite sides to take the round end of the square tool-steel pieces, which were held in place with ½-in. setscrews. A piece of stock to go in the toolpost was drilled for the wire and the fixture was ready.

The wire was fed through the holder in the toolpost until it touched the face of the piece in the chuck when the first tool, set to clear the holder by a distance equal to the diameter of the wire, bent it downward; the wire was then pushed forward again until the bent portion touched the face of the block when the second tool, which was ground to act as a shear in conjunction with



IMPROVISED BENDING AND CUTTING-OFF TOOL

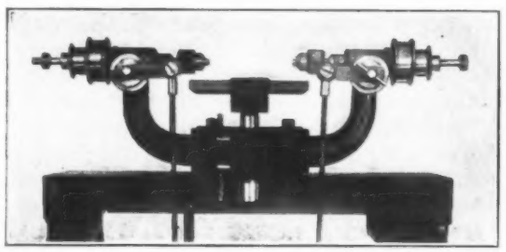
the holder, cut it off. The speed at which the lathe was run depended upon the skill of the operator. Although at first a few were cut off without bending, after a little practice a boy could bend and cut them off with astonishing rapidity.

Improvised Two-Way Drilling Machine

By Milton Wright

A two-way drilling machine was desired to drill holes on opposite sides of a small part that was to be produced in quantities. There did not seem to be just the machine on the market that was wanted and to build a special machine would require considerable time. The solution of the problem is shown in the accompanying illustration.

Two small bench drilling machines were taken from



AN IMPROVISED TWO-WAY DRILLING MACHINE

stock and the columns were cut off and clamped in the central casting, which is the only special part of the machine. This block had to be bored to fit the turned part of the columns and also bored at a right angle to take the post which supports the workrest.

The bed, which is obviously no part of a small drill press, was taken from an idle special machine, as were also the treadle and pull-rods. The whole contrivance was gotten up in a few hours' time and at much less expense than would be involved in the construction of a special machine.

It was made by the Grover File Co., of Nashua, New Hampshire.

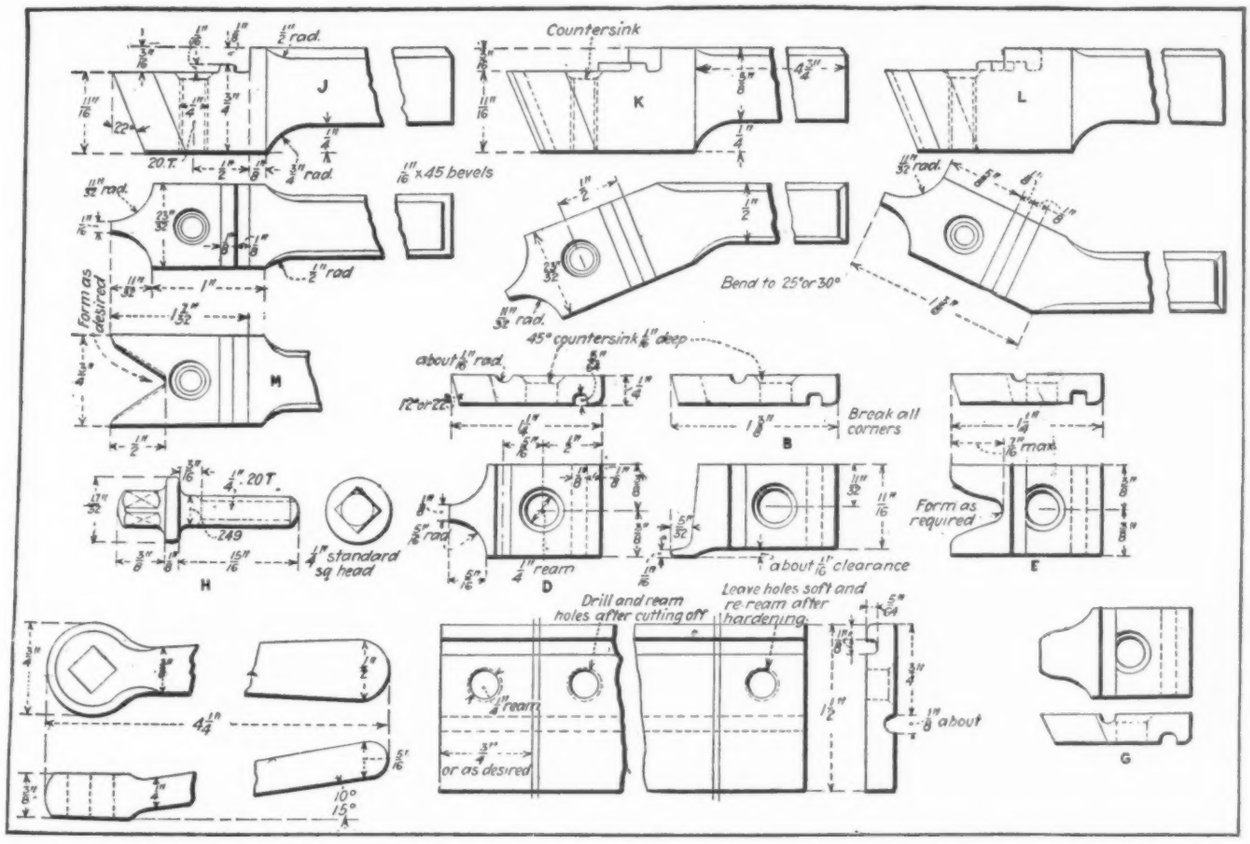
Toolholders and Interchangeable Form Tools

By Frank H. Cox

The types of form toolholders and interchangeable tools shown in the accompanying sketches have proved very satisfactory and useful, especially in the toolroom, showing a considerable saving in tool steel, the tools being readily exchanged or replaced when necessary. The sketches are almost self-explanatory.

The shanks of the holders can be made any desired size, but ⅝ x ½ x 4¾ in. and ¾ x ⅝ x 5 in. are suitable for the class of work for which the tools are designed: cornering, recessing, forming, etc., and backing off small gear, twist drill, reamer, tap-fluting cutters.

It will be noted that all the sharp corners are broken where necessary, thus avoiding most of the dangers of distorting or cracking the tools when hardening, and incidentally eliminating the use of sharp-pointed tools when producing them, a small, but important point which all mechanics will appreciate. It will be noticed that all information and dimensions are shown in a vertical position—this saves the toolmaker the necessity of doing "stunts" to enable him to read the drawing. Also some dimensions are repeated for clearness, and where not repeated reference to one of the other figures will give the necessary information.



DETAILS OF THE TOOLS AND TOOLHOLDERS

The tool blanks, which are machined in one piece as shown at *A*, are afterwards cut off to the desired widths and finished to their individual requirements. However, it will be found most convenient in some cases to drill and ream the hole after cutting off in order that the tool may be set off center if necessary as at *B*.

Tools for ordinary forming are given 6 to 12 deg. clearance, and those for backing off are given 20 to 22 deg. clearance. Most tools are hardened and tempered only to the half round groove, which is put in to facilitate grinding. Grinding should only be done on the top, care being taken not to alter the form by changing the angle of the plane.

In special cases harden and temper only where necessary, as in *B*, where only the point requires hardening. In all cases it is best to leave the holes soft if possible, and reream after hardening. If this is done the tools can be taken off for regrinding, and replaced approximately in the same position, as the maximum clearance or tolerance between the holes and the plain part of the screws is 0.001 in., as will be seen by comparing the screw *H* with the holes in the tool as shown in *D*. In reference to *E*, better results can usually be obtained if the space is made a little wider than the form to be produced, and side cuts taken.

The square head only of the screw *H* is hardened and tempered (or casehardened if mild steel is used) to a dark blue, and the threaded portion left soft, which can then be drilled out should it break off in the holder at any time.

In order to save the never ending discussion about the rights and wrongs of right-hand and left-hand bent toolholders or tools I always use letters or numbers, or a combination of the two, when marking for the operator's guidance and storage, taking care to have blueprints, or their equivalent—showing clearly the system in use—hung or fastened outside the tool stores, and in other conspicuous places in the workshops and drawing office, which makes it a matter of indifference as to the individual's opinion on this debatable point.

The holders shown at *J*, *K* and *L*, being all of the same type, would be marked with the same letter but different numbers and sizes, viz.: MO-$\frac{5}{8}$ x $\frac{1}{2}$ in.; M1-$\frac{5}{8}$ x $\frac{1}{2}$ in.; or M2-$\frac{3}{4}$ x $\frac{5}{8}$ in., as the case may be; the letter being used to designate the type of holder, tool, etc., and the numbers to distinguish whether straight or the direction of the bend. The holder *M* being of a different type would be marked F0, and bent ones of the same type would be marked F1 and F2, according to the direction of the bend, in addition to the sizes of the shanks. Also, there should be marked on the top of all toolholders and the instruction blueprints previously referred to the following: ALWAYS USE PACKING BETWEEN TOOLPOST SCREW AND TOOLHOLDER. The type, etc., of the toolholders should be marked in a conspicuous place, the back end being preferred, where it is less liable to damage; the position also being a convenient one from a storage point of view.

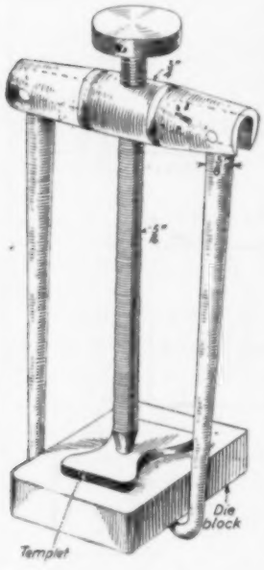
The tools, too, should be marked in the most convenient and conspicuous place, either the top or the edges being preferred.

Of course other systems of designating the tools may be used if preferred, but whatever system of marking is decided upon, cut out the right-hand and left-hand business, and by so doing you will save time, temper and money, to say nothing of language difficulties.

Clamp for Diemakers

By Charles Sehl

A clamp used for holding a templet on the die block to scribe the outline on the die, and also to hold the punch on the die in order to scribe the outline on the face of the punch, is shown in the illustration. This is an improvement over the old-style clamp in that it is made of round stock, making it easier of construction and lighter in weight.



CLAMP FOR DIEMAKERS

The top crossbar is made of cold-rolled steel ¾ in. in diameter with a hole ½ in. in diameter in each end within ¾ in. of the center of the screw, to make it lighter. The side arms are made of cold-rolled steel ¾ in. in diameter and tapered to ⅝ in. at the point of the hooks. The slots in the bottom of the crossbar are elongated to allow the side arms to swing all the way to the center and to open up to 8 in. wide at the point of the hooks.

The screw is ⅝ in. in diameter with a standard thread long enough to allow for holding a punch the entire length of the side arms.

Should Jigs and Fixtures Be Designed?

By Louis A. Schlossstein

It was with great interest that I read the several articles that have been published recently in the *American Machinist* discussing the question, "Should Jigs and Fixtures Be Designed?"

To my mind, the greatest argument in favor of designing most tools has not been brought out by these articles.

This communication is not an attempt to establish the superiority, if there is any, of the draftsmen over toolmakers, but is merely offered as a defense for the tool designer and his profession.

The tool designer should do the designing and the toolmaker should make the tools. If each does his share and does it well, there will be enough credit and glory for both. Keeping this in mind, the writer will try to show why the toolmaker should not design the tools.

In the first place, the toolmaker has not been trained to do designing in the strictest sense of the word. He cannot handle mathematics as readily as he should for obtaining angles, sizes and locations; his work bench and his surroundings are not at all suited for this branch of the work. He is not informed in regard to stock patterns or old patterns which might be used to advantage on the job in hand. He does not have lists of stock parts at hand from which to satisfy his needs. He does not often have the advantage of past experience on similar jobs or of the most efficient manner of locating or clamping work of a like nature. He cannot consult the blueprints of similar tools which have been made before, and has no way of keeping informed of desirable changes to be embodied on future work. All attempts at standardization are futile if the scheming up of the fixture is left only to the individual toolmaker.

All of the above points consume much more time in the toolroom and are not nearly so well carried out as if they were the product of the specialist—the man on the board who draws up a half dozen designs to the toolmaker's one.

A tool department without tool designers requires much more supervision and the foreman is hampered by details which should by all means be left to the men who have become expert on questions of methods, sizes and materials.

Another important advantage of designing is the economical use of raw material which is attained. Material is thus properly placed in required amounts only where needed for strength, stiffness and durability. As a rule, a tool designer is much better informed regarding properties of materials, mechanical movements and devices, and the construction of machinery. He is better educated; he reads more; has a more active mind and in every way is better qualified to tell how a job should be handled, because he is in close touch with the manufacturing departments. He also has the distinct advantage of being able to record his designs permanently on paper and to classify his information so as to make it instantly available at any future time.

When a tool is laid out on paper, consultations may be had by everybody concerned in its use in the shop. Thus we get the ideas and suggestions of several men embodied in every product of the tool designing department, and, quite frequently, changes have been found necessary which would have proven costly indeed, if the work had proceeded on the job in any other manner than with only paper and pencil. When first drawn up on paper, we know exactly how the jig or fixture is going to look; we can study its functions in advance; we know every detail of its construction; we know what material and how much of it is going to be used; in fact we can even tell very closely how long it will take to make it and how much it is going to cost.

The toolroom foreman has all his data and information given to him on the drawing and he is able to assign the work with more intelligence, greater accuracy and less loss of time. The result is that the work is systematically planned and carried out, delivery promises can be met with more certainty and the striving for the goal of efficiency is rewarded with success.

Know Why You Do Things

By A. W. Forbes

On page 565 of the *American Machinist*, John Brent gives some interesting criticism of a few articles that some of us have been writing. It is most interesting because it is so typical of the machinist and illustrates the points on which I usually start a fight with the same machinist.

"If the tool digs in Mr. Forbes will find that either the cut is too heavy for the tool or the lathe is too light to do the work, or the man who set the tool was careless." The last is probably the commonest cause, but suppose the second is the case. What would Mr. Brent have us do? Buy a lathe for a job that will last only two days? Not if he has to pay for it. It is up to the machinist to use the equipment and accomplish the results, yet I find that the average machinist will cuss the machine and lay down on the job. He will do the job, but will take no interest in it,

and take from twice to four times as long as he should. It is for this kind of work, as well as for the thousand other unusual circumstances that the machinist should know the why of the work.

It is all right for Mr. Brent to place his tool on center or above center as a general thing. I would do the same. But there are exceptions to the rule, and so long as Mr. Brent insists that the "real machinist will not set his tool below center," he is not likely to find these exceptions. If the tool digs in because the lathe is too light for the work, or for any other cause that cannot be controlled by the machinist, and it can be remedied by placing the tool below center it is up to the machinist to place it there, and if he wishes to be considered a first-class machinist he should find out that it should be placed there himself, regardless of any previous experience.

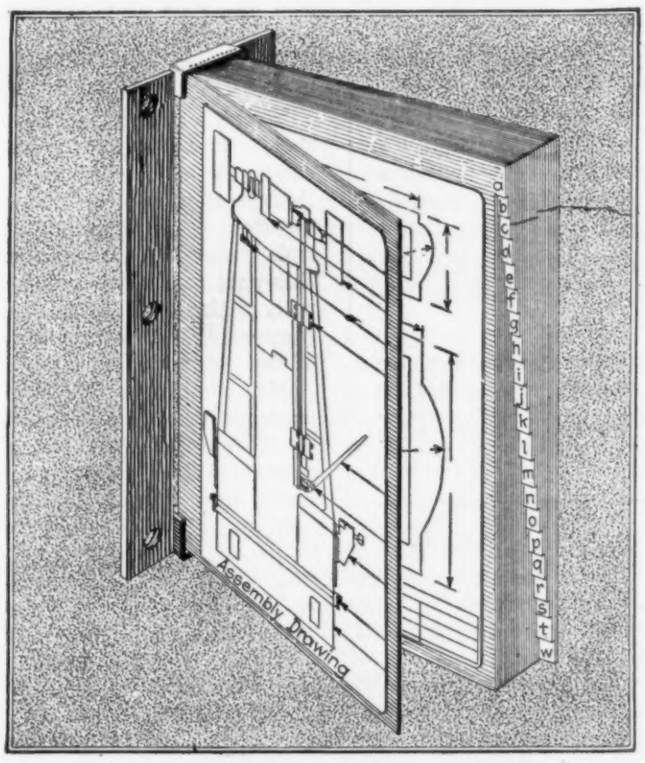
Ready Reference in the Assembling and Engineering Departments

BY F. G. GLOSH, JR.

Many machine-tool builders are now using the book form of prints for reference in the assembling of various units. This method involves a continuous "hunt" for the correct drawing, as well as handling of many unnecessary drawings to find the desired one.

The scheme as illustrated by the rough sketch attached, will save considerable time to the employer and considerable annoyance to the workman.

This is a book form of photostats which are mounted on sheet-metal pages and hinged from the back edges, and the entire form supported from the wall to



BOOK FORM OF PHOTOSTATS

allow turning of the pages. These photostats are shellacked for protection. The guide pages as indicated (*a*, *b*, *c*) are in the form of an index, in this manner subdividing the book form into sections, as many of which can be inserted as necessary.

The first leaf on this book form is a photostat of the complete assembly of the machine of one or two views. From this print horizontal lines are drawn from any part of the machine to the outer edge of this leaf. The end of this line will indicate where any particular part can be found and can be therefore turned to immediately.

New horizontal lines in conjunction with their respective pages can be added or taken out at any time, making this construction universal.

Set the Tool Above the Center

BY ROBERT J. DOXSEY

Under the title "Know Why You Do Things," on page 565 of the *American Machinist*, Mr. Brent calls Mr. Forbes to task for setting his lathe tool below center.

I agree with Mr. Brent as I find that by setting the lathe tool above center a shearing action is given to the tool and a heavier cut with a coarser feed can be taken with less power consumption.

With the tool above center the force of the cut tends to hold the work down in the machine bearings thus eliminating considerable vibration and the power being used to drive the tool only, whereas with the tool below center the force of the cut has the tendency to spring the work upward causing it to vibrate and ride up on the tool.

Form tools such as radius and thread tools should be set on center as their cutting edges must be radial in order to reproduce their own profile.

About the most conspicuous case of not knowing why you do things is a man setting his compound rest to half the included angle of the thread when chasing threads and then proceeding to feed in with the cross feed screw.

I set my compound over and feed in with it as by so doing the tool cuts on one side only therefore heavier cuts can be taken when roughing and when finishing the cut can be taken first on one side and then on the other thereby obtaining smooth threads with no tears in them; whereas if the tool is fed straight in it cuts on both sides and on the point at the same time causing the tool to spring and tear the work.

When boring holes, especially in long work supported by the steady rest, I turn my tool upside down and cut on the opposite side of the work or hole as this tends to force the work down in the steady rest against the shears of the lathe thus eliminating vibration.

Wherever possible, while using a boring bar with square toolbits, I grind up my toolbit on both ends with one cutting edge cutting up and the opposite cutting edge cutting down and take the cut on both sides of the hole at once. I set my tools so that one edge is in advance of the other thus actually taking two cuts one counterbalancing the other.

This tool acts similar to a drill only it cannot bore through solid metal; the hole must be cored or drilled out first.

I would advise Mr. Forbes to go into the nearest machine shop and when he comes to a lathe that is humming along merrily and the chip is coming off smoking and snaking its way along the floor and the machinist is wearing a satisfied smile or perhaps whistling a tune, to go over and examine the tool and he will find that it is set above center.

IN THIS ISSUE

AN ANALYSIS of the contents of this week's issue seems to indicate that the greater part of it is what is colloquially known as "how stuff." The first article is largely concerned with machine work on heavy parts. The material was gathered by Fred Colvin on his last trip to the Pacific Coast when he visited the Puget Sound Navy Yard. The boring and planing operations on the cylinders for an 1,800-horsepower triple expansion engine would certainly be considered as large work by even the most conservative of us.

Immediately following the navy yard article, on page 804, is one by Western Editor Hunter, describing the lay-out and equipment of the machine shop of a big tractor plant. Hunter says this shop is one of the most modern of its type in the Northwest and his illustrations seem to back up his statement. He has something to say of the equipment of the shop with special reference to conveying systems for parts and assemblies.

Another fact about the contents of the present issue crops up when we get to page 811 and consider the article on the machining of locomotive connecting rods, by Frank A. Stanley. This fact is that most of the articles are from west of the Mississippi River, a region which until recently was hardly considered a machine shop district. Stanley gathered his data in the Sacramento shops of the Southern Pacific. Most of the operations he describes are milling and boring ones on side and connecting rods and brasses. There is also something on shaper work.

"One of the vital essentials for foremen—even more than for others—is open-mindedness, the willingness to hear new ideas, to use new methods and to give them a fair trial." This admonition starts the current installment of the "Foreman and His Job" on page 814. It is undoubtedly sound advice for every foreman. Isn't it equally applicable to all the rest of us?

Following up our articles of the last two weeks on British and French shops of unusual interest, we have one this week from that remarkable new country, Czecho-Slovakia. You will find it on page 826. Czecho-Slovakia has suffered the growing pains of all new countries but has been unusually fortunate in falling heir to the well-developed industries of the old Austro-Hungarian Empire. Most observers predict a brilliant future for this thrifty little republic. The famous Poldi Steel Works is the subject of this particular article which tells of the machine equipment and other facilities of a plant which would be rated in any country as highly modern.

Turning now to the installments in this issue of our three principal technical series, we find on page 807 the beginning of the continuation of Mr. DeLeeuw's "Metal Cutting Tools," Part IX. This particular section takes up the details of construction and method of grinding of formed milling cutters. The grinding of formed cutters is not a very simple operation with our present equipment, and Mr. DeLeeuw's remarks are well worth careful study. On page 816 will be found more on the subject of drill jig design in the Dowd and Curtis series on tool engineering. The authors devote their attention this week to the design of jigs with proper consideration of clearance for work and chips, provision for wear on locating surfaces and setting up and removing of the work. They also describe the various types of drill jigs.

Directly after this article is the end of Part VI of Ellsworth Sheldon's magnetic chuck series. The chuck he is describing in this section, you will remember, is the Heald multiple magnetic chuck, and this part of it deals principally with the winding, impregnating and connecting of the magnet coils.

Mr. Chubb, our London correspondent and editor of the European Edition of the *American Machinist*, has a short and rather gloomy account of conditions in England, on page 843. He points out that wage reduction in the British engineering works are being seriously considered by employers and if they are put into effect there will very likely be resistance on the part of the men.

On page 823 there is another article on the labor situation by our old friend John S. Watts whose earlier articles on the relations between wages and production some of you may remember. This time his subject is unemployment and he goes after it in his usual keen manner. Starting off by exposing the fallacy of the suggested return to methods of barter, he goes on to discuss standards of living and how they are constituted, and concludes by giving as his remedy the equalization of production.

Coming Features

To the average citizen the principal use of paper in the machine shop would probably seem to be for the writing of reports and the keeping of records. But it has other and decidedly important uses as will be brought out by E. A. Dixie in the first article in our next issue.

After an unfortunately long interval we will resume the "Modern Production Methods" series with Part XVI. In this installment Mr. Basset covers methods of checking costs, the distribution of various charges to the proper departments and a discussion of machine-hour rates. As in other recent installments, examples to illustrate the actual figures in each operation are included. The cause of the delay in obtaining the data for this series has now been removed and we are glad to be able to say that the remainder of the articles will be published at short intervals in the near future.

Other series articles in the next issue include Part VII of "Magnetic Chucks," Part III of "Helical Spring Design," and Part IV of "Tool Engineering."

EDITORIALS

Mr. Hoover on the Commercial Situation

THE outstanding address at the recent meeting of the Chamber of Commerce of the United States was Herbert Hoover's. Not because of his official position, for it is our feeling that Mr. Hoover dignifies the office of Secretary of Commerce rather than that the office adds any great luster to his star. But coming from the man who has been justly called our greatest economist the address carried conviction to the hard-headed business men who listened to him.

Mr. Hoover is not blind to the difficulties of the present situation, as his first words show. His hopeful view of the future, therefore, need not be discounted. He said:

"In entering any discussion of our commercial situation it would be foolish not to acknowledge that we are in the midst of great economic difficulties. But it is infinitely more foolish for anyone to think we will not grow out of this situation.

"We have much upon which to congratulate ourselves. Our difficulties are infinitely less than those of Europe; we have weathered the danger point of a great crisis; our financial system has proved its strength and for the first time we have passed safely through a commodity crisis without a monetary panic. . . . We have had a remarkably small ratio of failures. *I am convinced we have fundamentally turned the corner.*

"There are many encouraging signs in this readjustment. There is very much less speculation and profiteering. Many manufacturers and wholesalers are making cuts in their inventories that equal or exceed the increases which they obtained when we were on the up grade. . . . Labor shows a willingness to make reductions in wages in many directions, and I believe is willing to face even further reductions if its sacrifices can be handed on in a general reduction of final price levels, so that the cost of living is in step. Labor is growing in efficiency.

"With the intelligence, productive power and resourcefulness of the American people we will emerge from all this, but the rapidity with which we recover will depend upon the promptness with which we grasp and well understand the nature of our difficulties, and upon the unity and energy of our action."

The Penalty of Bigness

EVERYBODY expects more from the big man than from the little one. This has its advantages for the big fellow in that more attention is paid to what he says even though the words be no more weighted with wisdom than those of his smaller brother. In the slang of the day he can "get away with it."

On the other hand the big man is called upon to carry the lion's share of the responsibility of the community. A failure by one of the small fry affects few others and is generally condoned by public opinion, but when a leader is overwhelmed he carries down many of his neighbors with him and the result is a serious loss to the public.

As with men, so with nations. Until the war the United States was a young and thriving country, making rapid strides toward world power but with the goal still ahead. Four short years have brought about a transformation. We have arrived, and as a big creditor nation with unparalleled resources and more than our share of the wealth of the world, what we have to say commands respectful attention.

With our new power has come the unavoidable responsibility that always goes with it and which we must face with determination. Our splendid isolation is a thing of the past and we are vitally concerned in what the other nations of the world do, just as they must heed our wishes and policies in forming their own plans.

We are facing the biggest job we ever tackled and we cannot afford to fail. The consequences would be too awful to contemplate, for they would bring the whole structure of our civilization tumbling about our ears and we should join the Egyptians, the Greeks and the Romans in being of historic rather than practical importance.

Are Panics Necessary?

WHENEVER an epidemic of some sort sweeps a city or a country, we take steps to find the cause and to prevent its recurrence. The human suffering, the cost to the community and the effect on the welfare of the next generation, all demand that such epidemics must be prevented or at least minimized.

We are now slowly recovering from a business industrial epidemic of cancellations, of pessimism and panic. Does it not behoove every thoughtful man who is interested in the welfare of his country and his family to devote a little time to finding the causes and the cures for bad times?

The bad effect of such business disturbances on the whole people can hardly be over-estimated. To be crying for production and to censure workers for not turning out more product, and then to close factories because of over production, cannot fail to cause dissatisfaction and distrust. Huge profits one year, and heavy losses and wage reduction soon after can hardly fail to bring resentment.

Workers and business men alike are victims of these industrial epidemics. They destroy confidence and cause pessimism. They sap the foundations of our civilization. Are they necessary or may they be avoided?

If depressions come from inflation—let us find some way to prevent inflation. If because of profiteering—then profiteering should be made an unhealthy occupation. If they can all be traced to wars, it certainly behooves us to put our best brains at work devising some methods of prevention.

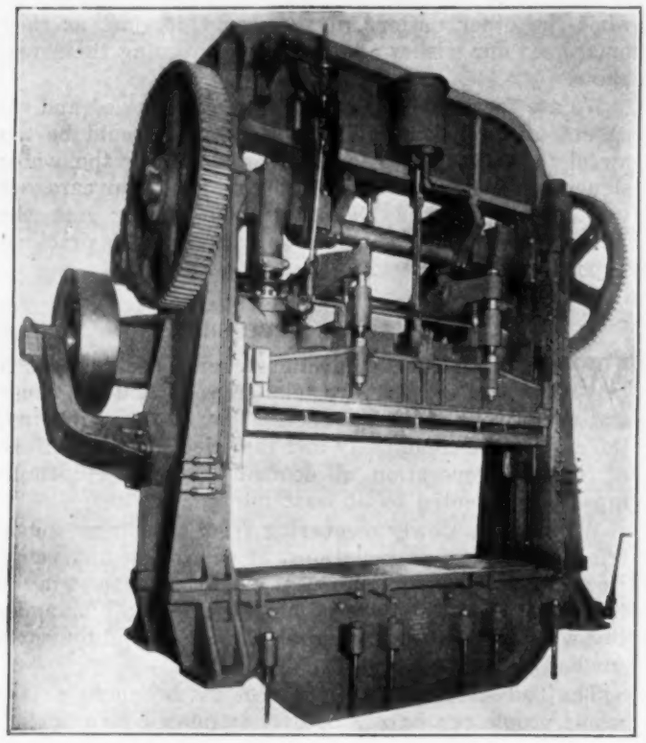
It is not enough to say we have always had panics and wars. Cuba and the southern part of the United States had yellow fever for centuries. But Gorgas found a way out. Has the world no financial, political or economic Gorgas?

Shop Equipment News

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval. Brief descriptions appear later in Condensed Clipping Index in both American and European editions.

Toledo Double-Crank Press

The Toledo Machine and Tool Co., Toledo, Ohio, has recently completed a large double-crank press intended especially for use in automobile manufacture. It is shown in the accompanying illustration. The press is said to be adapted to a wide range of work, and especially suited to the needs of builders of automobiles



TOLEDO LARGE DOUBLE-CRANK PRESS FOR AUTOMOBILE WORK

Specifications: Width between uprights, 173 in. Top of bed, 61x173 in. Bottom of slide, 42 x 164 in. Stroke, 18 in. Distance, bed to raised slide, 73 in. Motor, 100 hp. Weight, about 300,000 lb.

who do not have a sufficiently large output to warrant a power press for the performing of but one or two similar operations.

A cam-actuated stripping and holding device and a spring-pressure drawing attachment, both of which may be readily thrown out of action, are provided. The press may be used for blanking, forming and perforating side rails and running boards, for blanking and forming certain kinds of cross members and rear-axle housings, and also for blanking and forming fenders, aprons, doors and other of the large light stampings which enter into the construction of automobile bodies.

The cam-actuated stripper and clamping device is used in connection with the perforating dies, and the spring-pressure drawing attachment with some of the forming dies. The shut height, or distance from the bed to the slide when the same is in its lowest position, is sufficient to accommodate high dies. Ring risers are used to lessen the shut height when blanking dies are being operated.

The press is self-contained. It is fitted with a friction clutch having a hand-lever control and positive automatic stop, which permits of the instantaneous stopping or starting of the press at any point of the stroke, and causes it to run either continuously or to stop automatically at the top center after each revolution of the crankshaft. The power elevator is used for raising and lowering the slide, when setting dies. The centralized forced-feed lubricating system enables the operator to lubricate all of the main bearings from the floor. Two air cylinders, one in front and one in back, are mounted on the crown of the press to counterbalance the slide.

The drive is through twin gears on the main shaft, all gears being cut from the solid and protected by metal guards. No pulleys are furnished, as the press is driven by a motor belted direct to the flywheel. Considering its size, an idea of which may be had from the specifications, the press occupies but little floor space.

Wallace Bending Machines Nos. 8 and 14

The Wallace Supplies Manufacturing Co., 412-20 Orleans St., Chicago, Ill., has placed on the market two different types of bending machine. Fig. 1 shows machine No. 8, intended chiefly for the bending of reinforcement bars in large quantities, but also adapted to bending angle iron, channels, pipe or tubing, and special sections. The machine can be furnished either with an independent motor or arranged with friction clutch pulleys for belt drive.

Square twisted reinforcement bars 1½ in. in diameter can be bent on the machine, or two 1¼-in. bars at one

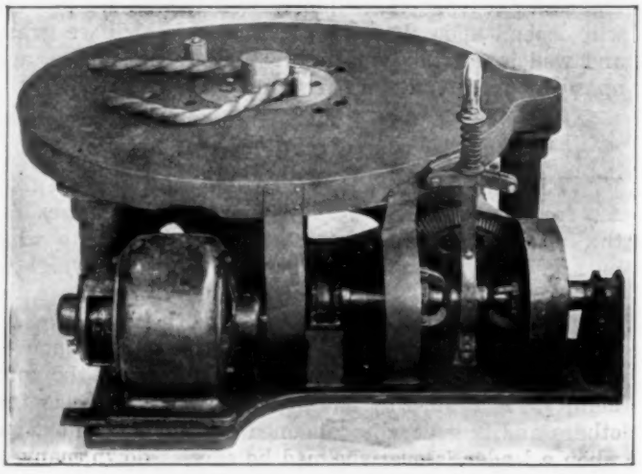


FIG. 1. WALLACE MOTOR-DRIVEN BENDING MACHINE NO. 8

time, or the equivalent in the smaller sizes of bars. By using extra high forming pins and rollers, small bars in quantities of from 8 to 10 can be formed simultaneously. When several bars are thus bent at one time, a U-shaped clip is placed over them for convenience in handling. Bars may be bent either from right to left or from left to right, thus avoiding the necessity for reversing the position of bars in order to make bends.

Special equipment for the bending of flats, rounds, squares, channels, angles, tees, and special sections can be furnished. A motor of 7½ hp. is required to operate the machine. The approximate weight is 3,500 lb. and the floor space required is about 6 x 6 ft.

In Fig. 2 is shown pipe-bending machine No. 14 fitted with friction clutch pulleys for power drive. It is intended for bending standard iron pipe or tubing up to 4-in. pipe size, or 4½ in. outside diameter. The roller bracket is adjustable to take forms up to 48 in. in diameter, and is operated by an eccentric lever to force the tube or pipe into a groove or form, for holding the outside follower bar close to the tube.

The machine is operated by a lever, engaging friction clutch pulleys for forward and reverse drive. Adjustable stops are provided to suit any degree of bend required. The clutch is automatically thrown out of engagement at both the end of the bending operation and at the starting position after the machine has been reversed.

The pipe is secured to the form by means of a strap and eccentric lever, and both the inside follower and the form are grooved to the proper diameter. The outside

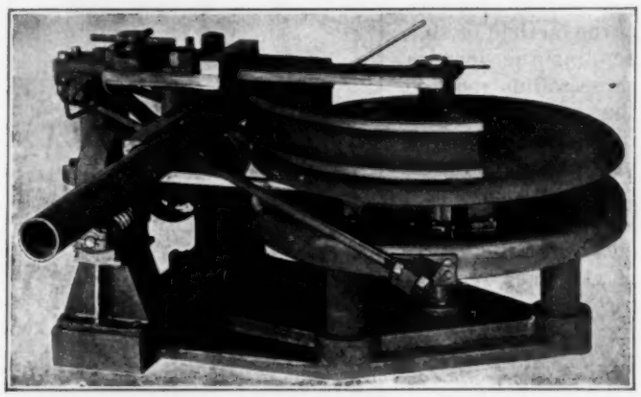


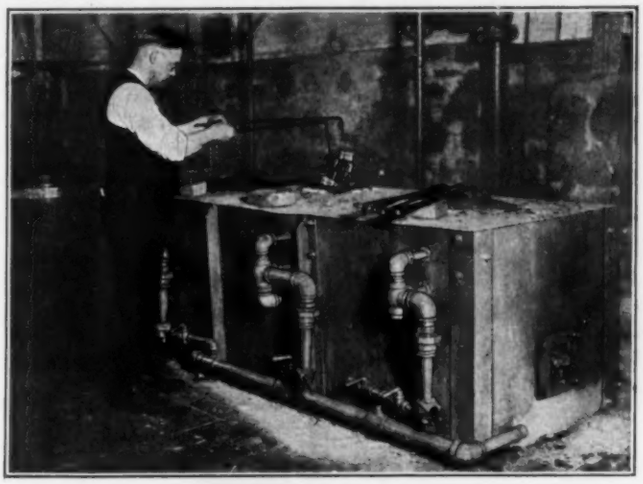
FIG. 2. WALLACE PIPE-BENDING MACHINE NO. 14

follower bar operates between the tube and roller instead of working directly on the tube. Bends can be made cold without the use of an inside follower or floating mandrel. Four-inch pipe can be bent to a radius as small as 24 in. Special forms with inside follower bars or floating mandrels can be furnished for bending light gage tubing to a short radius without flattening or crimping. Six standard forms are furnished with the machine, but special equipment can be provided for bending any desired radius on pipe or on material of other sections.

Bellis Heat-Treating Furnace

The Bellis Heat Treating Co., Blake and Valley Sts., New Haven, Conn., is prepared to install furnaces and supply crucibles and salts for the Bellis process of heat-treating high-speed and other steels.

For high-speed steels a triple-unit furnace, shown in the accompanying cut, is used. Though burners are supplied for all three chambers, those in the outer chambers are for the purpose of bringing the furnace quickly to working temperature, after which they may



BELLIS TRIPLE-UNIT HEAT-TREATING FURNACE

be shut off and the relative heats maintained by the flame from the central chamber passing through suitably disposed flues.

Either gas or oil burners are used. They are set tangentially in circular chambers, so that the flame does not impinge directly upon the crucibles. Crucibles for the higher temperatures are made double, with an outer shell of special refractory material and a lining of steel, which does not react chemically to the molten heating compound. The furnaces are of suitable size for the hardening and tempering of all small parts and tools that can be handled manually.

Hinckley-Myers Cylinder Reboring Mill

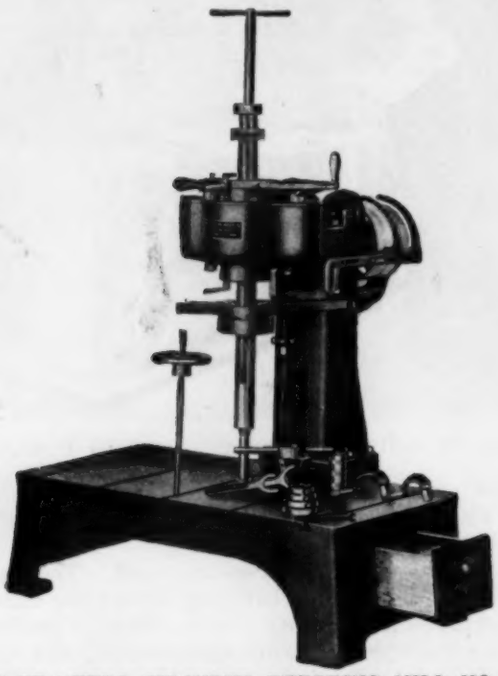
The illustration shows a power-driven machine for reboring automotive engine cylinders. It is made by the Hinckley-Myers Co., 19 N. Michigan Ave., Chicago, Ill., and is designated at No. HM-7. The machine will rebore open-head cylinder blocks not exceeding 20 in. in height and having cylinder bores from 2-13/16 to 5 in. in diameter. The table is low, so that the motor blocks can be easily placed in position for reboring. The pilot bar is lowered through the cylinder, centering in a hardened bushing in the table. A hardened, split, tapered centering fixture is then placed around the pilot bar and forced into the cylinder top, in this way locating the cylinder block so that the pilot bar will be in the center of the cylinder.

The cutter head contains three adjustable cutter blades, each blade being set independently by a micrometer gage to the over-size desired. The head is then mounted on the boring or cutter bar, which is maintained in its proper relation to the cylinder by traveling over the pilot bar. The cutter bar is lowered until the locking clamp rests on the top of the cylinder block, it then being fastened by bolts to the base, no wrench being required.

The cutter bar is hollow and runs in adjustable bronze bushings at both the top and bottom of the power head. It is driven by a hardened steel worm and bronze gear and double-pitched spur gears. The speed of the cutter head is about 40 r.p.m. The cutter bar is fed automatically and is provided with an adjustable stop collar which may be set to stop the boring when the

cutter head has reached the bottom of the cylinder, thus requiring no attention while cutting. It takes about five minutes to rebore a cylinder.

It is said that the machine is free from chatter, because the boring bar is so well-supported, and that the

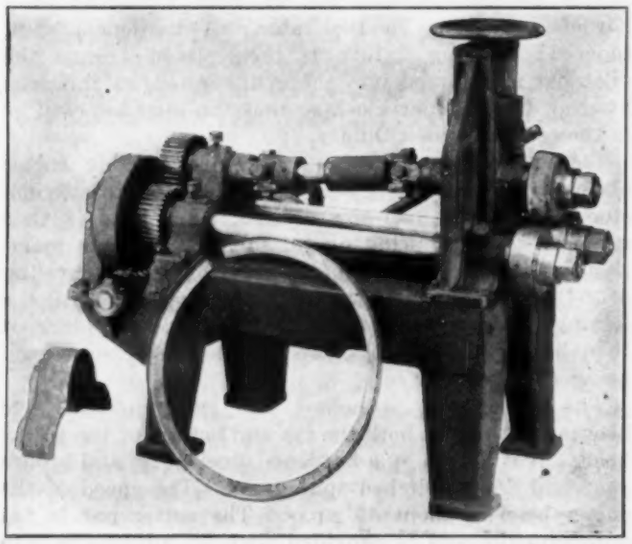


HINCKLEY-MYERS CYLINDER REBORING MILL NO. HM-7

cylinder is bored at right-angles to the crankshaft bearings. The machine consumes only about 1 hp. in operation. The floor space required is 50 x 40 in. and the weight 1,500 pounds.

Wallace Ring-Coiling Machine No. 3

The illustration shows a machine recently placed on the market by the Wallace Supplies Manufacturing Co., 412 Orleans St., Chicago, Ill., and intended for the manufacturing of rings and coils. The rolls are removable and can be changed to suit the character of the section to be bent, handling angles, channels, tees, tubes, and bars of standard or special section. Angle iron 2 x 2 x ¼ in. in size can be bent cold to a circle as small as 30 in. in diameter, while lighter sections can be bent to smaller circles. Twisted or deformed structural bars can be bent, as in the forming of helices such as are used for reinforcing concrete columns.

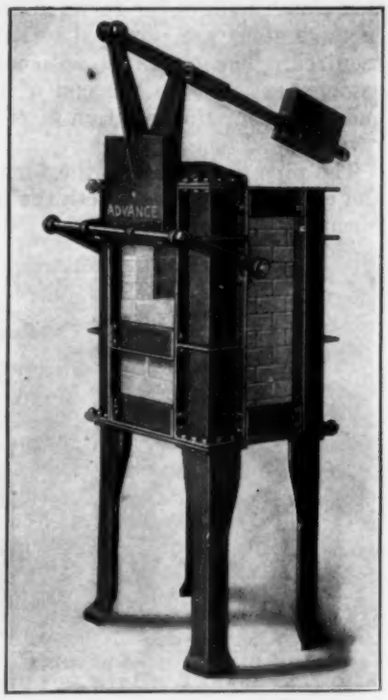


WALLACE ADJUSTABLE RING-COILING MACHINE No. 3

The machine is known as the No. 3. It is driven by belt on friction-clutch pulleys, which can be engaged by means of a hand lever to drive in either direction. The position of the upper roller is adjustable by means of a hand-operated screw to give the required diameter to the coil or ring. The machine occupies a floor space of 42 x 54 in. It is substantially made and weighs 1,200 lb.

Advance Tool-Hardening Furnace

A small furnace designed for the purpose of tool hardening and for the heat-treatment of small parts has been brought out by the Advance Furnace and Engineering Co., Springfield, Mass. It is of the semi-muffle type in which the flame chamber is located below the floor of the heating chamber, the heat being conducted to the latter by flues. The burner is located in the rear of the furnace and may be adapted to the consumption of either gas or oil fuel. A noteworthy feature is the method of suspending the door on three radius rods, so that when it is lifted it does not drag the hot firebrick lining against the furnace front but swings away in a long arc, at all times remaining vertical and coming to rest against the furnace front again when it reaches the full open position. The furnace shown in the illustration is made for handling carbon steel only. Furnaces of the same design for heating high-speed steel have an additional heat-insulating covering and a sheet-iron jacket on account of the higher temperature used.

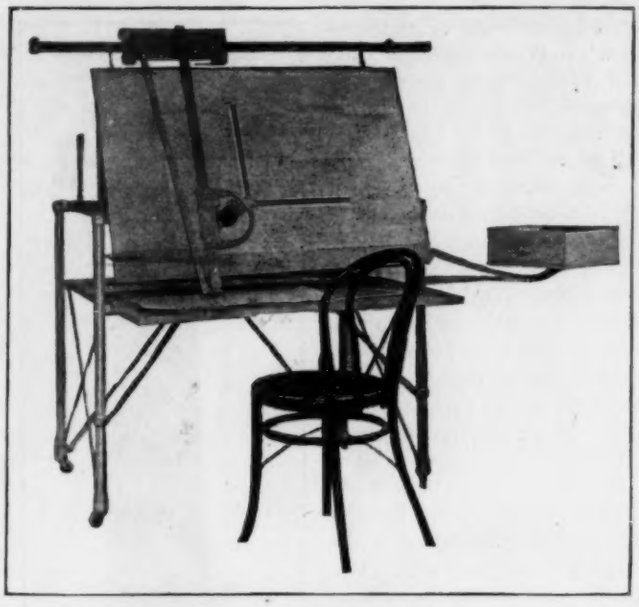


ADVANCE TOOL-HARDENING FURNACE

Simplex Drafting Outfit

The Simplex Tool and Instrument Co., 820 North Third St., Camden, N. J., has recently placed on the market the drafting outfit shown in the accompanying illustration. The equipment consists of a frame carrying the board, on which is mounted the parallel-ruling device holding the scales. In the illustration the frame is shown mounted on an iron table, but it can be furnished separately to place on the top of an ordinary table.

The board may be placed in either a horizontal or



SIMPLEX DRAFTING OUTFIT

vertical position, no notches or screws being required to hold it in place. When in the former position, the operator may use a drafting stool, and when in the latter position, the operator may reach all parts of a 24 x 36-in. drawing while sitting on an ordinary chair, it is said. When the board is raised, all parts of it may be reached from the standing position. The board is independent of the frame, so that any board may be used, it being secured in position by only two screws. Weights placed at the back of the machine counterbalance the board.

The sliding horizontal board shown underneath the main board forms a table to hold reference drawings up to 24 x 40 in. in size, and it may also serve as a desk for clerical work. Removable casters are supplied. A drawer and tray are provided at the side of the machine for holding pencils and drawing tools.

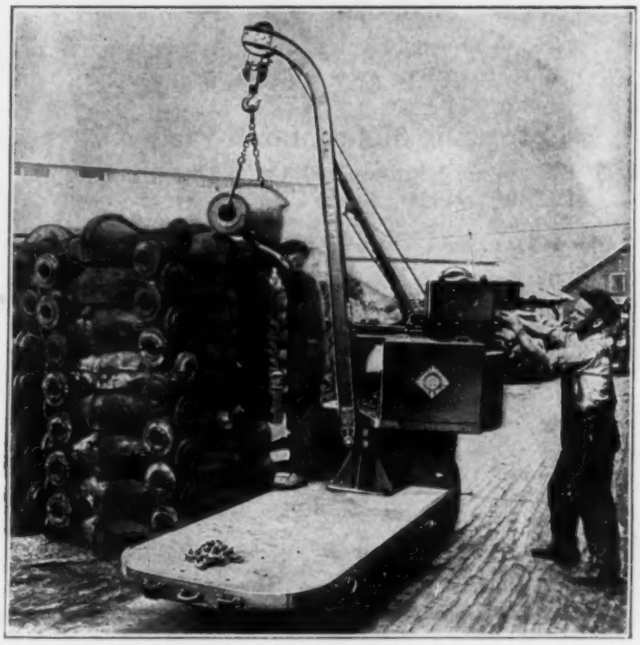
At the top of the board is a track on which runs a carriage holding the bar that extends across the board. The rollers on the carriage are far apart, so that the bar is held rigidly, and the carriage may be locked in position on the track when desired. An indexing head is mounted on the bar, a clamp being provided for holding it in position. Two scales placed at right-angles are held on the head, the scales being swiveled easily by means of the left hand, and leaving one hand free to use the pencil. The indexing device is graduated and provided with notches for quick adjusting. At the top of the board is a spacing device for the making of section lines, the latch of the device being easily disengaged when not in use. Locks on the various movements hold the scales in the position in which they are left.

Elwell-Parker Electric Crane Truck

The Elwell-Parker Electric Co., Cleveland, Ohio, has fitted its low-bed electric industrial truck with a crane. The machine, which is thus adapted for loading, hauling and tiering, is shown in the illustration in use for the handling of castings. It is said that the crane can pick up 2,000 lb., and can stack material to a height of 8 ft. The truck itself can carry a load of 3,000 lb., and travel from 300 to 400 ft. per minute.

The revolving crane column is carried on large ball and roller bearings, and can be swung by hand. The boom may be raised or lowered and locked in any position desired, so that the load may be placed at any point on the truck platform. The power for this movement is obtained from the same motor that winds the cable. A hand brake is provided for use when lowering the load at slow speed. The power unit for the crane consists of a totally inclosed motor, a drum controller, the hoisting mechanism and the battery, so mounted as to counterbalance the load. The boom can be locked in a central position when not in use.

The truck itself uses a standard arrangement of either Exide Ironclad or Edison battery, the battery being assembled in a single box that may be easily removed. A totally inclosed inter-locking drum controller and circuit breaker are provided. It is said that no fuse is necessary. All four wheels are used for steering and the two rear ones for driving. It is said to be adaptable to a very wide range of uses, both indoor and out.



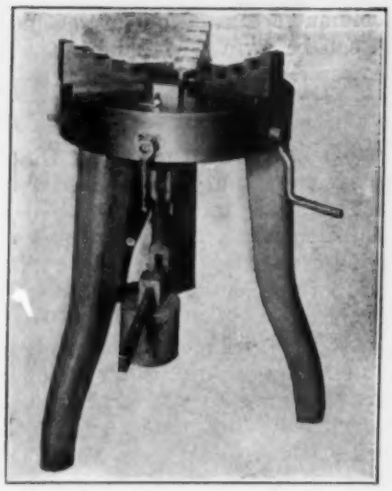
ELWELL-PARKER ELECTRIC CRANE TRUCK

The loading of freight cars and the handling of bulky material may be easily performed, and the crane may be fitted with an 18-in. magnet for the handling of scrap material.

Commercial Wheel-Bushing Chuck

The illustration shows a chuck made by the Commercial Welding and Machine Co. Inc., 21 Commercial St., Worcester, Mass., for the purpose of bushing grinding wheels. The device embodies two independent chucks, one holding the bushing arbor, and the other the wheel or part to be bushed. It is said that the work is centered accurately, and held so that the hole will be at right-angles to the side of the wheel.

The chuck is dust proof, since no openings are uncovered in operation, and felt packing is used under the jaws and at the openings for the screws. The work-holding chuck is said to be very substantial, but adjustable to a fine degree and sensitive enough to hold delicate work without straining or breaking it. The bush-



COMMERCIAL CHUCK FOR BUSHING GRINDING WHEELS

ing chuck is made in an 18-in. size, mounted on three legs. A lathe chuck is made in a 12-in. size for turning abrasive wheels. Arbors on which to cast the bushings can be furnished in sets from ¼ to 5 in. in diameter, a standard stem 2 in. in diameter being secured to each one. The arbor or mandrel is made oversize, to allow for shrinkage of the lead or babbitt. The large arbors are hollow, so as to reduce the amount of expansion occurring upon heating. The arbor chuck and the wheel chuck are adjusted by means of wrenches on separate screws on the periphery.

St. Louis Metal Match Plates

The St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo., has developed a line of steel and aluminum match plates adapted for light and medium

ST. LOUIS METAL MATCH PLATE

foundry work. The patterns are secured to the plates, thus insuring that the cope and drag parts of the molds will fit each other properly.

The plates consist of flat sheets of metal, each provided with clamps and guides for fitting the flask pins. They are made either round, rectilinear or in any shape desired, and with the ears in the center or at diagonal corners, as shown in the accompanying illustration. The plates are said to be light in weight, and to enable the preparation of sound molds with a minimum of time and work. They are ordinarily used for work done in large quantities, and usually in connection with a molding machine.

The plates are made in ten standard sizes. A plate 12 x 19 in. is used to fit a 10 x 12 in. flask, inside measurement, and a plate 16 x 25 in. to fit a flask having an inside measurement of 14 x 18 in. The steel plates vary in thickness from ⅛ to ¼ in., it being stated that a thickness of ⅛ in. is sufficient for any kind of work in 10-in. flasks, and for squeezer work where both sides are molded at once. The aluminum plates vary from ¼ to ⅜ in. in thickness, and are said to be lighter than the steel plates and non-corrosive.

Austin Power-Head Grinders

The J. L. Austin Mfg. Co., Milwaukee, Wis., builds a line of power-head grinders of the type shown in the illustration. The machine is made in three sizes, and can be furnished either with or without the pedestal, and with single-pulley or double-pulley drive, the latter being used on the machine shown.

The arbors are of high-carbon steel and run in babbitted bearings that are split to take up wear. All bearings are equipped with self-oiling spring oil cups. The collars are pressed onto the arbors, and counterbored for the purpose of excluding dirt and dust from the bearings. The rest arms are equipped with both an angle and a bevel tool rest, and the back bracket is eliminated for the purpose of allowing more room around the wheel. The wheel guards are one-piece grey-iron castings.

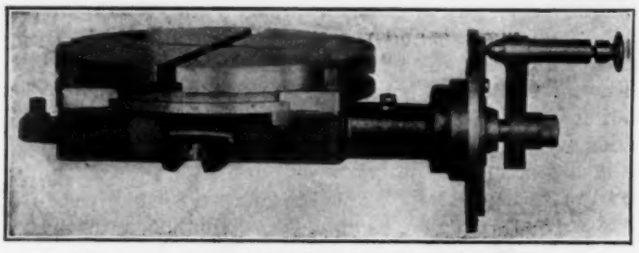
AUSTIN NO. 3 POWER-HEAD GRINDER

Specifications: Built in three sizes; Nos. 2, 3 and 4. Respective capacities: Wheel size, 8x1, 10x1½ and 12x2 in. Base of head, 4x7½, 5x9 and 6x14 in. Height from base of head to center of spindle, 5, 6 and 7 in. Length of spindle, 14, 17 and 25 in. Pulley size, 2½x2, 3½x2 and 4x2 in. Weight of heads; with one pulley, 21, 28 and 65 lb.; with two pulleys and guards, 38, 52 and 95 lb. Height of pedestal, 33, 32 and 31 in. Floor space of pedestal, 10½x12¾, 11x14 and 13x18 in. Weight of pedestal, 60, 80 and 120 lb.

Rhodes Rotary Indexing Table

The Rhodes Manufacturing Co., Hartford, Conn., is bringing out a rotary indexing table intended primarily for use in connection with its shapers, but equally serviceable on a milling machine, drill-press, or wherever such a table may be required. Slotted ears on three sides of the base and a hole through the index bracket on the fourth side provide a way to bolt the device to a machine table.

The wormwheel on the under side of the rotary table has 40 teeth, and three index plates are provided, with



RHODES ROTARY INDEXING TABLE

which any number of divisions up to 360 may be obtained. The position of the index plate is fixed by a latch upon the bracket engaging in a series of notches upon the periphery of the plate, the notches being so spaced as to provide adjustment corresponding to one minute of arc at the rotary table. Adjustable plugs of hardened steel provide means of compensating for the wear of the worm and wormshaft bearings.

The rotary table is graduated in degrees, thus enabling the operator to make angular settings. Four clamping plates hold the table firmly in any position, or they may be adjusted to allow the table to revolve freely. The diameter of the table is 8 in., and the total height of the device above the machine table, 2½ inches.

Notes on Solders and Soldering Fluxes

Preparing Work for Soldering — Composition and Use of Various Solders — Corrosive and Non-Corrosive Fluxes — How To Make and Use Them

BY E. ANDREWS

AMONG the many familiar metallurgical processes with which we have to do in the engineering industry, the process of soldering is one of the most familiar. Soldering is a process whereby two pieces of metal are joined by another metal or alloy having a lower melting point than the metals to be soldered; the fusing point of the solder must, however, approach as nearly as it conveniently can to that of the article to be joined, as a more perfect and more tenacious junction may thus be effected. It is also necessary that there should be a certain amount of interfusion or alloying between the solder and the metal to be soldered, an intimate union of the two thus taking place. To achieve this result the surface of the metal must be entirely free from oxide and dirt. There is a great variety of solders termed respectively aluminum, bismuth, brazing, hard, soft, silver, plumbers', tinners' and many others; they are, however, broadly distinguished as hard and soft solders. Hard solder fuses at or above a red heat. Soft solder melts at comparatively low temperatures, and is used for soldering most commercial metals. Metals to be joined may be either of the same or dissimilar kinds; but the solder used must have an affinity for both and should agree with them as nearly as possible in malleability, and hardness.

Soft solders consist chiefly of tin and lead although other metals are occasionally added to lower the melting point. The melting point of lead is 621 deg. F. and tin 450 deg. F., yet when these two metals are alloyed in equal proportions to form ordinary solder (half-and-half) the melting point drops to about 370 deg. F.

If bismuth is added to tin-lead alloys the melting point is still lower. Bismuth possesses the property of expanding on cooling, a very unusual one in metals generally. It is, therefore, used not only to make the solder more easily worked by lowering its melting point, but if added in sufficient quantities its expansive tendency counterbalances the effects of the contraction of the other metals. Alloys of bismuth, tin, and lead, have very low melting points, which can be further lowered by the addition of cadmium. A composition of pure metallic tin, and zinc, is in some cases used as a solder, as in the case of soldering articles made from pure tin, and galvanized-iron work.

Most aluminum solders are alloys of tin, zinc and aluminum with from 5 to 15 per cent aluminum, 8 to 15 per cent zinc, and 75 to 95 per cent tin. Some aluminum solders contain a small percentage of copper, phosphorus or nickel—never exceeding 2 or 3 per cent, however.

Soft solders are variously termed common, medium, or best, according to the percentage of tin; those containing the most lead being the cheapest, and having the highest melting points. Fine or best solder is largely used for soldering Britannia metal, brass, and tinplate articles; commoner qualities are used for ordinary work. Solder used by plumbers for wiping joints on lead pipe is made of two parts of lead and one of tin. It is plastic when cooling and it is due to this property that the plumber depends on wiping a joint.

Antimony is an objectionable impurity as it renders the solder less fluid when melted and tends to prevent perfect adhesion of the surfaces. It is sometimes added, however, in small precentages in order to obtain surface appearance of the solder; as the sale of soft solder is influenced largely by appearance rather than by analysis and utility, and solder containing 2 per cent antimony, 45 per cent tin, and 53 per cent lead is superior in appearance to that of the tin-lead alloy in equal proportions.

Zinc, even in very small quantities, has an injurious effect on soft solder, interfering with the soldering properties and dulling the surface. Aluminum acts in a similar way. Phosphorous, in a very small amount renders soft solder very "lively," that is, the solder has a tendency to run freely. Too much phosphorous is injurious. When phosphorous is used it should be in the form of phosphor-tin. One or two ounces of 10 per cent phosphor-tin in 1 cwt. (112 lb.) of solder is generally sufficient.

A rough test of the quantity of tin in solft solder can be made by listening to the characteristic "cry" of the tin when the solder is bent. If is emits a slight cracking noise, it is good; but should the cracking noise be excessive, a little more lead is desirable. The quality of the solder may also be judged by its outward, or surface appearance; with excess of lead, the surface will have a grayish-white color; with excess of tin the surface will be bright with grayish-white spots.

Table I gives the compositions of various soft solders, together with their approximate melting points.

TABLE I. COMPOSITION OF SOFT SOLDERS

Solder	Percentage				Melting Temperature	
	Tin	Lead	Bismuth	Cadmium	C.	F.
No. 1	25	75	00	00	250	482
No. 2	33.3	66.7	00	00	227	441
No. 3	40	60	00	00	215	421
No. 4	50	50	00	00	188	370
No. 5	66.7	33.3	00	00	171	340
No. 6	63	37	00	00	173	344
No. 7	60	40	00	00	175	347
No. 8	33.3	33.3	33.3	00	140	284
No. 9	40	10	50	00	116	240
No. 10	20	30	50	00	100	212
No. 11	25	25	50	00	93	200
No. 12	12.5	25	50	12.5	60	14

Solders 1 to 7, are used by plumbers and tinsmiths. Solder 4, is the one mostly used, while solder 5 is especially adapted for use on thin lead and tin pipes, tinplate work, etc. Solder 8, has a very low melting point, and is often used for soldering delicate sheet metal and artistic metal work. It can be fused on metal surfaces by the flame of a gas jet or candle. Solder 11, known as D'Arcet's alloy, is often used by pewterers, and solder 12 known as Wood's alloy is used in engineering works and factories for fusible plugs in boilers, electric installations, et cetera.

No solder containing over 50 per cent of tin should be used for general soldering work with the soldering copper, and in a great many cases a solder composed of 40 per cent tin and 60 per cent lead will give satisfactory results. Tin being about ten times the price of lead, a small reduction in the quantity of tin makes a considerable difference in the value of the solder.

Cadmium is a promising substitute for part of the tin in solders, and a composition of 80 per cent lead, 10 per cent tin and 10 per cent cadmium gives good results for many purposes. The tensile strength of cadmium solder is about 5,800 lb. per square inch or about the same as that of the 40 per cent tin and 60 per cent lead solder. Its ductility, however, is approximately twice that of the ordinary soft solders. Owing to the high percentage of lead in the cadmium alloy, the price is very reasonable compared with a solder containing a high percentage of tin. Solder that has been exposed to damp atmosphere for some time and has become more or less oxidized on the surface will not give as good results as fresh solder.

With the use of hard solder a higher temperature is required than can be obtained with the ordinary soldering copper; therefore, it is necessary to use either a hearth fire, blowlamp, or gas blowpipe, or to dip the parts to be joined in a bath of molten spelter. When making a joint with hard solder, it is desirable that the solder have a lower melting point than the metal or metals to be united. Absolute cleanliness is as important with hard as with soft solder.

Hard solders are generally used for joining brass, copper, iron, and steel parts. Table II, gives the composition of hard solders with approximate melting points.

TABLE II. COMPOSITION OF HARD SOLDERS FOR VARIOUS METALS

Metal to Be Soldered	Percentage Copper	Zinc	Characteristic	Variety	Melting Temperature C.	F.
Iron and steel	63	37	Very strong	Hardest	908	1,666
Copper and thin iron work	60	40	Strong	Hard	890	1,634
Copper and brass	50	50	Medium	Medium	880	1,616
Copper and brass	41	59	Fairly fusible	Fine	840	1,544
Thin brass work	35	65	Easily fusible	Very fine	816	1,500

Brass for brazing or hard soldering should contain at least 75 per cent copper in order to prevent its melting and flowing away during the jointing process.

Silver solder is a hard solder containing silver, copper, and zinc. It is equally applicable to brass, copper, iron, german silver, sterling silver, steel, etc. The advantage of silver solder lies in the freedom with which it will melt and flow though it is not as fusible as the soft solders composed of tin and lead.

Silver solders are made in a number of different grades of fusibility, cost, and color, but they are generally composed of about 60 per cent silver, 25 per cent copper and 15 per cent zinc. An excellent silver solder of low fusing point is composed of 50 per cent silver; 35 per cent copper, and 15 per cent zinc.

Borax, or borax and carbonate of soda may be used as a flux for silver solder. The heating is usually effected by a blowpipe. The flux should be applied before heating if possible.

Silver solder is remarkably fluid when in a molten state, and penetrates interstices which ordinary hard solders would fail to fill. Another advantage of silver solder is the fact that it may be rolled into sheets or drawn into wire and may, therefore, be employed for many classes of work in which hard or brazing solder could not be used. Furthermore, silver solder is very strong and tenacious, consequently it makes the strongest joint of any known solder, and as it melts so readily there is less danger of "burning" the joint of the metal being soldered.

Soldering fluxes should be determined by the nature of the work. If sheets of soft brass, copper, galvanized steel, tinplate or zinc are to be soft soldered, the common fluxes, as ammonium chloride (salammoniac), zinc chloride, or resin may be used. But if the work is something more delicate or important, as in the case of soldering electrical apparatus, the effect of the corrosion of zinc chloride on the work must be considered.

The rapidity with which a soldering flux acts is an important factor in its usefulness. If the flux be in the form of a dry salt, a comparatively high heat is necessary to fuse it. If an aqueous solution be used, a certain amount of heat is essential to evaporate the water. The function of a soldering flux is to have a solvent action on the oxide, thereby keeping the metal surface clean and excluding the air.

Zinc chloride has several properties which make it a valuable soldering flux for most work, as it remains liquid at the temperature of molten solder, thus being in a condition to act upon the oxides very readily. Some workers add a quantity of water to zinc chloride flux, but that is detrimental, because the stronger the flux can be made and still remain liquid, the better it will be.

To make zinc chloride solution, dissolve clean metallic zinc (preferably in small pieces) in hydrochloric acid until the acid will not take up more. The zinc should lie in the acid for at least twelve hours, when any excess may be removed, and the soldering flux is ready for use. Zinc chloride is poisonous and should not be used in soldering fruit or meat tins, or any utensil containing food. It has a burning action on the skin, and is corrosive, as it frequently contains free acid; consequently it should not be used when soldering electrical apparatus. In all cases where this flux is used, the surfaces of the metal should be thoroughly washed and dried after soldering to prevent the acid action after the job is done.

Resin, either as a powder or an alcoholic solution, is a splendid flux where speed is not required. But it has the undesirable property of leaving a sticky, gummy mass on the metal surface after the evaporation of the alcohol, which is a hindrance in many kinds of work. It is, however, the best flux to employ where a non-poisonous flux is desired. It is also an excellent flux for soldering operations on electrical conductors, as it is free from acid, and is a fair insulator.

Ammonium chloride is extensively used as a soldering flux, particularly on brass or copper work, as it does not tarnish these metals, but when used on zinc, it forms zinc ammonium chloride and causes more or less corrosion.

Table III, gives soldering fluxes for various metals with methods of application.

A good non-corrosive flux can be made by dissolving as much clean zinc in one ounce of hydrochloric acid as the acid will take up and stirring this compound into eight ounces of vaseline to form a paste.

For hard soldering, borax is the best flux, as it dissolves any oxide that may exist on the surface of the metal and protects it from the air, thus allowing the solder to come in actual contact with the metal. Preferably, burnt or calcined borax in powdered form should be used as it will not swell or froth up.

TABLE III. SOLDERING FLUXES

Flux	Metals or Alloys	Used With
Stearin or lard oil	Aluminum	Aluminum bit or blowpipe
Zinc chloride	Brass, copper and tinplate	Copper bit
Resin	Lead, lead and tin alloys	Copper bit or blowpipe
Ammonium chloride	Brass, copper and iron	Copper bit
Hydrochloric acid	Zinc and galvanized stee	Copper bit
Olive oil	Britannia metal, pewter and tin	Copper bit or blowpipe
Borax	Brass, copper, iron and steel	Blowpipe or hearth fire
Boracic acid or Carbonate of soda	Brass, copper, iron and steel	Blow pipe orhearth fire

Business Conditions in England

Wage Reductions in Engineering Works Imminent—Strikes Will Probably Follow—Many Orders Lost to Germany and the United States

BY OUR LONDON CORRESPONDENT

GREAT BRITAIN has been carrying on for a number of years now under continually renewed threats of strikes and similar industrial disputes. It is possible that the worst has been passed, although of course, many more industrial troubles are still ahead. Workpeople generally are under the mistaken impression that the employing side have entered into a conspiracy to reduce wages.

For some time in engineering, employer and employed have disagreed over such matters of detail as the running of machines, working of overtime, number of apprentices, and so on. But for a month or so it has been apparent that the employers would move for a marked reduction in wages and notice has now been given; it will almost certainly be resisted.

As a general kind of justification the Engineering and National Employers' Federations have issued a pamphlet on the present economic position of the industries concerned. It discusses the causes for the present very definite decline leading to the conclusion that "it is very certain that an active state of trade cannot be resumed without lower selling prices, involving a much lower cost of production." A number of examples of lost orders, etc., are given. Outside of certain firms engaged on heavier tools where work for some few months remains yet in view, the industry is so far from being active that it may be described as merely existing. One well-known firm has not received an order of any magnitude for a year, while three working days in the week indicate a relatively good state of employment Obviously the shops are not working on commercial orders, but merely to keep the men together, and the limit to this must pretty quickly be reached.

England Losing Railroad Trade

In engineering Great Britain of late had rather congratulated itself on its success in obtaining orders for locomotives. Armstrong-Whitworth, in particular, have apparently done well. Yet the federations mentioned are able to tabulate a long list of orders lost to Great Britain in competition with America, Germany and, significantly, Canada. Commencing with June, 1919, and ending with February last, the value today of orders that have thus passed us by are estimated at £3,000,000. Both electrical engineers and textile machinery manufacturers are now experiencing the general decline, and the motor industry has not shown that measure of life the period of the year was expected to bring.

Exhibition running has for some years proved to be one of the most profitable branches of business. It might almost be said that recognition of this fact led to the formation of the Machine Tool Trades Association, whose exhibition in the autumn of last year at Olympia, W., proved no exception to the rule. Now the Society of Motor Manufacturers and Traders is able to show from its two exhibitions, held simultaneously at Olympia, W., and the White City, W., last autumn, a profit of more than £28,500. Announcements of reductions in prices in cars continue to be made, the Manchester made Crossley car, for example, having been dropped in price by £325. The Wolseley Co. is reviving a small power car, and the Austin Co. will place a 10-hp. car on the market before long.

While absolute fatalities are confined to the smaller and newer concerns, the larger organizations are not reporting in lively strain as to the financial position.

The Iron and Steel Market

The condition of the iron and steel market need hardly be mentioned. It is reported that the Middlesborough district steel works are shut down, such orders as are coming forward being filled from stock, while forward buying generally is described as quite at a standstill. In shipbuilding a reduction of 146,000 in tonnage launched last quarter and of 113,000 tons commenced is reported. As to shipping, according to an official estimate the deadweight laid up, which was 2½ million tons at the end of January, is now 5 million tons. As something of a set-off to a generally dismal record the statement may be made that Armstrong, Whitworth & Co., Ltd., has obtained a contract for the Ebute Metta workshops, near Lagos, for the Nigerian government railways. The contract includes the supply of new locomotive-, carriage- and wagon-shops, a power station, and so on, and the time for completion is two years.

Living Costs Declining

The cost of living, as officially determined, continues to decline, and at the beginning of April was very nearly back to the figure of a year ago. Taking the average of retail prices into account the Ministry of Labor has calculated that the increase as compared with July, 1914, was 133 per cent, a decline in a month of 8 points, due mainly to decrease in the cost of food and to some extent in clothing. Changes of wage rates during last month officially reported showed that 350,000 workpeople sustained decreases amounting to £60,000 a week, while 11,000 received increases amounting to about £2,900 a week. Decreases occurred in the case of woolen and worsted operatives, the hosiery, silk, carpet and asbestos trades, also iron miners, mill men, and other iron workers, among youths in the Midland district and among some other metal workers in the same area. Unemployment continues to increase and official statistics for April 8, subject to some revision, show that about 1,615,000 persons were registered as unemployed, of whom 1,092,000 were men, and 394,500 women, with in addition about 897,000 workpeople on short time. The districts worst hit appear to be the northwest of England, London, and certain Midland areas, the largest increase of late being in the north of England.

The International Financial Situation

A committee of the London Chamber of Commerce has reported on the international financial situation, ascribing the causes of the present bad trade to poverty and want of purchasing powers of individuals in countries affected by the war; to the exchange levels and their fluctuating character; to depreciation of currency

of various nations as compared with gold and inflated issues of paper; to trade as far as it is carried on "being directed by individuals according to its profitableness or otherwise into entirely different channels from those in which it flowed before the war"; to governments spending more than national income and in some cases balancing by creating paper currency; to war debts and to "dearth of credit caused by the war and by the nations themselves having to borrow from their own subjects to meet their expenses."

Universities Appeal for Funds

The newer universities of Great Britain have for some time been making appeals for funds to the local interests, the appeal ranging from an address from the vaudeville stage to special visits, preceded by luncheons, by representatives of industries that may be supposed to be specially interested. Thus the other day Birmingham University—out to get £500,000 of which £290,000 has been obtained—invited a score or more of the local civil, mechanical and electrical engineers to an inspection of the engineering side at Selly Oak, where, by the way, may be seen the second permanent-magnet electroplating dynamo by Woolrych, made in 1851, and also a Wilde magneto machine, in which, it is understood, Faraday took some interest. Here Prof. F. W. Burstall is undertaking a number of engineering investigations, including one on grinding which suggests that hardness of abrasive is not the most important feature, and another on the heat-treatment of metals.

Against the Metric System

Once more report has been made against the general adaptation in Great Britain of the metric system. A special committee of the conjoint board of scientific societies concluded "that it is not desirable to make the change compulsory except perhaps in one or two special trades." Reforms in British weights and measures are recommended, including the abolition of the pole, furlong, league, grain, stone, quarter, and hundredweight of 112 lb., and the complete abolition of apothecaries weight, and the abolition of the peck, bushel, quarter, chaldron, barrel, and the sq. rod or perch and rood, areas being expressed in acres and decimals or in square feet for small plots. While it is recommended that the British system of units of weights and measures shall be retained in general use the committee favors the compulsory use of the metric system in the whole trade in fine chemicals and drugs.

Babbitt Bearing for Lathe Spindles

By James Ellis

In our shop we have a lathe of about 22-in. swing and of a rather heavy design that gave us quite a bit of trouble about five or six years ago by running hot in the spindle bearings. The lathe was not very old then and should not have given any trouble, but in spite of plentiful oiling and frequent adjustment it would not keep cool for any length of time.

The spindle was all right and the boxes were well fitted up. It was decided to bore out the boxes and babbitt them in the hopes that we could cure the trouble. We lined them with a standard brand of nickel babbitt, tinned to the bronze, and fitted them again. This time we had no trouble in keeping the boxes cool and they would retain their adjustment under any condition of speed. Of course some of the old heads predicted that the job would last only about three months.

Until about two years ago this machine was used on a general run of jobbing shop work, and got more than its share of the heavy work. At that time we fitted the lathe with a special milling attachment, using a gang of cutters which would give the spindle a much more trying test than it could possibly get as a lathe. Since then the machine has run every day, and a good many nights, and has given not a particle of trouble in the bearings.

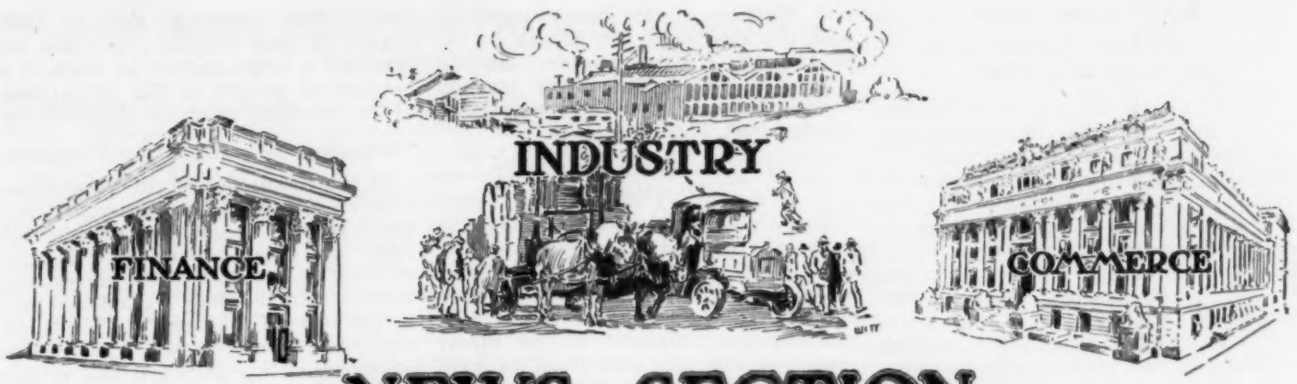
We had the opportunity to examine these boxes a few months ago when we replaced a gear on the spindle (we worked the lathe hard enough to wear out the gear) and were rather surprised to find that the bearings were in as good a condition as one could want. I do not know how many liners were put between the halves when the job was put up, but we found that there was still about $\frac{1}{8}$ in. there and I doubt if there was much more in the first place. These babbitted bearings have been much more satisfactory than the solid bronze bearings in some of our other lathes.

The bronze bearings seem to have a tendency to score, not bad, of course, but to make little fine rings around the spindles (they might not do this if the spindles were hard) and our experience has been that the bronze will heat much more quickly than will the babbitt. We have two machines with solid bronze boxes that are particularly troublesome on that score whenever any job calling for high speeds is put on them. Our lathes that have babbitted bearings have never given us any trouble by heating.

The putting of babbitt inserts in the bronze boxes seems to help; strips across the box or a few holes drilled in and filled with babbitt. This may be done without changing the alignment of the machine, which is something we must guard against. Whenever we overhaul a lathe now, whether for our own use or for a customer, we put babbitt strips across. This is done quite frequently on engine brasses, and in some cases it is almost impossible to make them run satisfactorily unless it is done.

When the brasses are taken out after a year or so it is generally found that the babbitt strips are worn just a trifle below the brass. Now I do not know how to explain that exactly, except possibly the babbitt has a greater affinity for the oil and gets more of the wear that comes on the bearing because the oil "sticks" to the babbitt more than it does to the brass. It is not because of the location of the strips for they will wear below the brass regardless of where they are put.

As to the style of bearing for a lathe spindle, I prefer those made in halves rather than any of the tapered forms. Those made in the form of a split sleeve adjusted by nuts at each end are apt to give more or less trouble when the time for adjustment comes. It seems to be very difficult to get them adjusted exactly after they are worn a little without setting them up a little too tight and then letting them wear to fit. This is possibly due to the fact that the front and back bearings seldom wear alike nor in the same direction and when they are tightened their relative position is altered slightly. Of course, after the bearings have been adjusted several times the outer cone will no longer fit its hole except at the center of each of the segments. This often will make the lathe chatter, and is hard to find unless you have had similar trouble before. Perhaps it is time to get new boxes by the time this happens.



NEWS SECTION

Cleveland and Chicago Meetings of A. S. M. E.

Leading engineers in thirteen cities will take part in the largest joint local section meeting yet held by the American Society of Mechanical Engineers. Engineering clubs and local sections in Akron, Buffalo, Chicago, Cincinnati, Columbus, Detroit, Erie, Rochester, Toledo, Indianapolis, Ontario, Pittsburgh, and the Engineering Society of Dayton have been invited to participate in the meeting which is expected to rank with the society's big spring meetings in promoting acquaintanceship and giving opportunities for instructive technical sessions.

Cleveland Meeting in June

The Great Lakes Regional Meeting, as it has been termed, will be held on June 13 and 14, in Cleveland, under the auspices of the National Committee on Local Sections, of which Prof. W. H. Kenerson, of Brown University, Providence, is chairman, and Charles Penrose, of Philadelphia; Samuel B. Ely, of Pittsburgh; Thomas L. Wilkinson, of Denver, and J. H. Herron, of Cleveland, are members.

The Spring Meeting

The meeting follows shortly after the 1921 spring meeting of the society which is to be held at Chicago, May 23 to 26, which includes sessions in three cities, the preliminary events beginning on Saturday, May 23, at McCook Field, Dayton, Ohio, and an important two-day program having been planned to follow immedately after the Chicago meeting at the Rock Island Arsenal.

Officers Elected at Gear Manufacturers' Convention

At the fifth annual convention of the American Gear Manufacturers' Association held at Cincinnati, Ohio, the following officers were elected for 1921: F. W. Sinram, of the Van Dorn & Dutton Co., Cleveland, Ohio, re-elected president; R. P. Johnson, of the Warner Gear Co., Muncie, Ind., first vice-president; B. F. Waterman, Brown & Sharpe Manufacturing Co., Providence, R. I., second vice-president.

New President of Manning, Maxwell & Moore Co.

J. M. Davis has been elected president of Manning, Maxwell & Moore, Inc., 119 West 40th St., New York City, in place of the late A. J. Babcock. Mr. Davis was formerly vice-president of the Baltimore & Ohio R.R. and general manager of its New York and Staten

J. M. DAVIS

Island rail lines and terminals. He also served seven years as an operating officer with the Union Pacific and Southern Pacific, known as the Harriman lines, and for a like period in similar capacity with the Great Northern Railroad.

Exhibition Company Acquires Permanent Quarters

Notice has been received of the establishment of the Manufacturers Exhibition Co., Inc., of New York, in the old Siegel Building at 45 West 18th St., which will be the permanent home of the exhibition.

After extensive alterations have been made the exhibition will open with a full display of American manufactured articles including machinery, tractors and trailers, cotton, wool and knit goods machinery, printing presses, hardware and electrical equipment. L. R. Duffield, formerly president and general manager of the International Exposition of Industries, Grand Central Palace, N. Y., is president and general manager of the company.

Krupps Patenting U. S. War Devices

A complete overhauling of American patent laws as they apply to the issuance of patents to foreigners is in prospect as the result of revelations which Secretary of War Weeks has made to Congress.

Weeks in a letter to the Vice-President said that Germans are patenting in the United States, military inventions used by the United States government itself.

The patentee, he said, in 201 instances since July 1, 1920, is Frederick Krupp, of Essen, Germany. The Krupps prior to the great war were the largest manufacturers of armament in the world. Since that time their factory was reported to have been diverted to manufacture of things other than war implements.

Still Have War Interest

But Weeks' information indicates they have not lost their interest in war, and while their factories are supposedly engaged in peacetime industries, they are keeping up with us in military preparedness.

Weeks in explaining how it was possible that the patents might be issued while the two nations still remain in a technical state of war said he had been informed issuance is permissible under the trading with the enemy act.

He suggested changes in all patent laws, as they apply to foreigners, which would protect Americans against alien monopolies, such as Germany acquired in the dye industry.

Anniston C. of C. Favors Open Shop

The Chamber of Commerce of Anniston, Ala., has gone on record in resolutions approving and supporting the open shop policy in the manufacturing plants of that city, and condemning the closed shop policy as detrimental to the general welfare of industry. The action was taken at the request of Anniston manufacturers who recently advocated the open shop policy. Anniston is said to have more foundries and shops which manufacture pipe and fittings than any other city in the United States.

Washington Notes

By Paul Wooton

Washington Correspondent

As a result of the developments during the World War things mechanical have taken on a new importance in warfare. Major-General Clarence C. Williams, Chief of Ordnance for the War Department, believes that the increased importance of mechanics in war has not been grasped by the public and is only partly realized by mechanics and mechanical engineers. If the country is to maintain its military position it must progress mechanically, he points out. As a consequence he believes it to be an important step in the national interest that every mechanical engineer, every machine shop operator, and every mechanic should strive for higher standards and should always keep in mind improvements and developments in the vast machinery equipment of the modern army.

The Civil Engineer

In Caesar's day, said General Williams in conversation with the American Machinist's Washington correspondent, the civil engineer was the all-important adjunct to armies. Roads had to be built, bridges constructed and fortifications thrown up, but the mechanical equipment of the soldier of that period consisted of a short sword and a leather shield. Under conditions then existing the need for mechanical appliances was insignificant as compared with the need for civil engineering.

It was not General Williams' idea to minimize in any way the importance of civil engineering in modern warfare but to contrast the growth in importance in the application of mechanics to warfare. He pointed out that the highest order of intelligence and the greatest of skill alone can cope with the myriad mechanical problems with which a modern army must deal. They range from the niceties of automatic pistol construction to the complicated systems of recoil on great guns. Every army mechanical problem, he declared, is further complicated by the fact that rough usage must be provided for.

The Mechanic in the Army

The design, manufacture, operation and repair of the vast machinery equipment of an army is so great that it means that every soldier and every officer must be something of a mechanic, while a very considerable portion of them must class as experts. There must be specialists in literally thousands of lines. Military operations in the future will be on such a large scale that it will be utterly impossible for the little peace-time army to train more than a fraction of 1 per cent of the mechanics that would be needed were it necessary to enter a conflict with a powerful enemy. The army's specialists must receive their training in the nation's machine shops.

Incidentally, it may be said that General Williams is very much impressed with the success of the British in improving the military tractor. He will not be surprised if artillery traction is revolutionized as an outcome of that development.

No Super-Power Plants at Mine Mouth

Large power plants at mine mouths have been pointed to for years as the ideal development of the future. After a very careful consideration of this subject in the Boston-Washington area the engineers engaged in the super-power survey are understood to have reached the conclusion that such a plan is impracticable, at least so far as concerns plants of the size contemplated for the inter-communicating electric system which may be found feasible for the great industrial region along the eastern seaboard. Much to the surprise of some of the engineers connected with the super-power work there appears to be an insufficiency of water for condensing purposes, either at the mine mouth or elsewhere within the boundaries of any of the larger coal fields. Even the large nearby rivers have been eliminated. The eastern branch of the Susquehanna contains too much sulphur. The Delaware River cannot be used, since the storing and discharging of water in such large quantities would cause an irregular flow of the river, which would greatly impair its use for power purposes. It is conceded, however, that there is little to be gained by having a plant in the vicinity of a mining region since a rail haul would be necessary and once on the cars coal could be carried a few miles further to tidewater where plenty of condensing water would be available. In addition there would be the various advantages of having the plant near large centers of population.

So far as the anthracite field is concerned as a location for one of the super-power plants, it has been found that the steam sizes of anthracite are too valuable for use as fuel in such a plant. There is no locality with sufficient culm or waste coal in the immediate vicinity to supply a plant of that character.

It also is pointed out that should a permanent plant of the size contemplated be erected in the immediate vicinity of even the largest bituminous mine, its requirements would be so great as to exhaust the mine in a comparatively few years.

The conclusions of the super-power survey will be announced next month. It is believed that a super-power system will be found feasible and that recommendations will be made as to how it may be made effective.

Coast Defense Revolutionized

Development during the World War of mobile artillery has revolutionized coast defense in the United States. Historic old forts are to be dismantled. In substitution, high power rifles mounted on railway carriages will be based at strategic points along the coast. The carrying out of this change of coast defense policy will necessitate a large amount of work of a mechanical nature in the preparation of the necessary guns and their mounts.

Ordnance Bureaus Work Together

In the discussion of the reorganization of the government departments, the statement frequently is made that there is a great amount of duplication of work on the part of the Bureaus of Ordnance in the War Department and in the Navy Department. This is denied by ordnance officials. The closest co-operation is maintained and neither bureau has secrets from the other. Some claim a positive advantage for separate bureaus predicated on the axiom that two heads are better than one. The same problem thus is approached from different angles with much resulting good.

Foreign News Notes

The German State Railway administration has just placed large orders with the German locomotive and car works. These orders call for 1,706 locomotives and 23,517 passenger and freight cars, the total value of these orders being 5.2 milliard marks. One-half of these orders has to be delivered during the summer and the other half during the winter of the present year. The railway administration intends introducing 50-ton freight cars and the car works have been asked to submit drawings for this new type of cars. It is expected that by the introduction of these large cars the freight traffic will be facilitated. The introduction of this type of cars will, of course, necessitate the re-construction of the overhead material which has seriously suffered during the war. Large orders are about to be placed for this material too.

Italian Engineering Works

The largest Italian engineering works, Gio, Ansaldo & Co., at Rome, Genoa and Sampierdarena, which are capitalized at 500 million lire, are not in the position to pay a dividend for the last year. The net earnings amounted to only 5,947,763 lire for 1920, which will be forwarded on new account. The second largest engineering works, however, the Terni Steel Works, declared a dividend of 9 per cent on the entire capital stock.

A Roumanian Market

American manufacturers of all kinds of oil well machinery, tools and supplies should find a good market in Roumania. Most of the old material is used up or has been destroyed in consequence of the war. The Roumanian petroleum companies are largely increasing their capital stocks and a good deal of money will be spent for the purchase of new machinery. The most prominent Roumanian oil company, the Steaua Romana, of Bucarest, has just increased its capital stock to 310 million Lei.

National Foreign Trade Council Holds Big Convention at Cleveland

"American Foreign Trade and Its Present Problems" was the general theme of the eighth convention called by the National Foreign Trade Council, and held in Cleveland, Ohio, May 4 to 7. The slogan of the convention was "Greater Prosperity Through Greater Foreign Trade." Between 1,800 and 2,000 delegates attended.

In calling the convention to order, James A. Farrell, president of the U. S. Steel Corporation and chairman of the National Foreign Trade Council, placed emphasis upon the fact that the United States has the capacity to produce and the raw material and labor required, but needs further organization of financial machinery for foreign trade. He said that everybody is affected by the world wide slowing down and that the welfare of all is linked up with the satisfactory solution of our foreign trade problems. His talk included mention of the effect of the slump in foreign trade upon our merchant marine, presenting a problem of what to do with our ships.

Convention Officers

Alexander Brown, president of the Brownhoist Co., of Cleveland, and president of the Cleveland Chamber of Commerce, was elected president of the convention. O. K. Davis, secretary of the National Foreign Trade Council, was elected secretary of the convention. Fred I. Kent, of the Bankers' Trust Co., of New York, addressed the first general session on "Financing Foreign Trade." He said in part: "It is no more possible for a country to be sufficient unto itself, than it is for a community, or a family, or any individual in it. There is always some point in human development beyond which progress cannot be made without the impetus of foreign stimulation. A man can go so far, a family can reach a little beyond, a community has still further powers, and a country can make much progress; but if any of these units are confined entirely within themselves, they will sooner or later reach a maximum of intelligence after which retrogression is certain to follow."

In speaking of the effect of corporations formed under the Edge Act, Mr. Kent lauded the aims and purposes of the Foreign Trade Financing Corporation. He urged a more thorough understanding and more co-operation on the part of American bankers and manufacturers, toward the building up of this new financial institution.

The first or morning session was closed by an address by W. E. G. Harding, governor of the Federal Reserve Board, Washington, D. C., on "Frozen Credits, What They Are and How To Thaw Them." The following extracts are taken from Mr. Harding's address:

"The present is the time for courage in the business world. Now is the time to do things . . . We stand on a firmer and saner financial basis than we did a year ago . . . We are now entering upon the last stage of the post-war period. As far as the banking world is concerned, our worst problems are passed . . . The Federal Reserve Banks are in an exceptionally strong position with 55 per cent gold reserves. This is a higher percentage than at any time since 1915. The Federal Reserve Banks are now able to take part safely in a movement to stimulate business with a view to thawing out frozen credits."

Long-Time Credits

The afternoon session was devoted to the topic "The Need for Long-Time Credits in Our Foreign Trade." In speaking on the value of long-time credits to the exporting manufacturer, George R. Meyercord, president of the Illinois Manufacturers' Association, Chicago, dwelt at some length on the Foreign Trade Financing Corporation. He said:

"As I view the Edge law foreign trade financing machinery, it offers the first step whereby the manufacturer gets some reasonable measure of relief toward creating that highly desirable, stabilized situation whereby his frozen inventory is rendered more liquid.

"Every day American manufacturers are being offered profitable European business that they reluctantly are obliged to decline because this country has lacked the foreign trade financial machinery that has been developed so successfully by Great Britain.

"The manufacturer who invests in the stock of the Foreign Trade Financing Corporation will be amply repaid. It will be a profitable investment. It will help every manufacturer and business man in the country. It will solve employment problems and restore the general prosperity to which progressive industry is entitled."

Frank H. Taylor, president of the S. S. White Dental Manufacturing Co., in his speech, made the statement that "this is the right time to exercise ourselves in foreign business."

Foreign Trade Policies

The topic for the third general session was "Foreign Trade Policies." D. R. Williams, of the American Chamber of Commerce, Manila, Philippine Islands, spoke on the effect of double taxation on our foreign trade. He said: "Americans are held liable to the exorbitant rates of the United States Act while Filipinos, Britishers, Germans, Japanese and other trade rivals of every race and color, go their way unmolested. As these latter pay no tax to their home governments upon their Philippine income, it results that in our dependency and under our own flag, we penalize our own countrymen in favor of foreigners."

"Government Service to Foreign Trade" was the title of an address by J. Walter Drake, of the Hupp Motor Car Co., Detroit. Mr. Drake urged the reorganization of the U. S. Foreign Service.

At this same session Lewis E. Pierson, of the Irving National Bank, N. Y., spoke on the settlement of our export balance, and Richard Spillane, of the *Philadelphia Public Ledger*, gave an address on the use and value of foreign news.

The fourth general session dealt with "The Merchant Marine." The speakers were James A. Farrell, president of the U. S. Steel Corporation, who spoke on "American Maritime Policy"; William D. Winter, of the Atlantic Mutual Insurance Co., New York, who spoke on "Practical Problems of Marine Insurance"; Furman D. Pearce, of Norton Lilly Co., New Orleans, whose address was on "Marine Operating Problems."

The last general session had as its topic "National Programs for Foreign Trade" and was concerned with reports of the group sessions and of the convention general committee, and with miscellaneous business. There was a total of eleven group sessions scattered over the first three days of the convention. They dealt with commercial education for foreign trade, foreign credits, special export problems of the manufacturer, the motion picture in foreign trade, the organization and location of the export department, foreign trade advertising, inter-American trade relations, interest of agriculture in foreign trade, banking service to foreign trade, the services of the export-commission house, and trade relations with the Far East.

Special Features

A feature of the convention was the Trade Advisor Service. The council assembled a body of men possessing technical information based on experience or practical observation and they were available to delegates as "trade advisors." A. E. Ashburner, of the American Multigraph Sales Co., Cleveland, was in charge of the service and was assisted by G. A. O'Reilly, of the Irving National Bank, New York.

The convention enjoyed the co-operation of the Bureau of Foreign and Domestic Commerce of the Department of Commerce; the Department of State; Post Office Department, and the Bureaus of Markets, Standards, and Education. The Pan-American Union also was represented. Dinners were held by the Export Managers' Club of New York and the Advisory Committee on Foreign Mails, and a luncheon was held by the American Manufacturers' Export Association. The convention was closed, with the exception of a Saturday morning general session, by a banquet held in the Statler Hotel at which Senator Walter E. Edge, of New Jersey, spoke on "Our Foreign Trade." An abstract of this address will appear in a later issue of the *American Machinist*.

C. A. Moffett Heads Steel Company

The election of Charles A. Moffett to the presidency of the Gulf States Steel Co., and the retirement of James Bowron, president, and his election to the chairmanship of the board of directors, came as a big surprise in industrial circles in the Birmingham district.

Mr. Bowron is one of the oldest and best informed iron and steel men in the South. He resigned from the presidency, a position he has held since the organization of the corporation in 1913, because of advancing years. The new president, who was vice-president and general manager, retains the latter position. He is also one of the best-known men in iron and steel circles in the South.

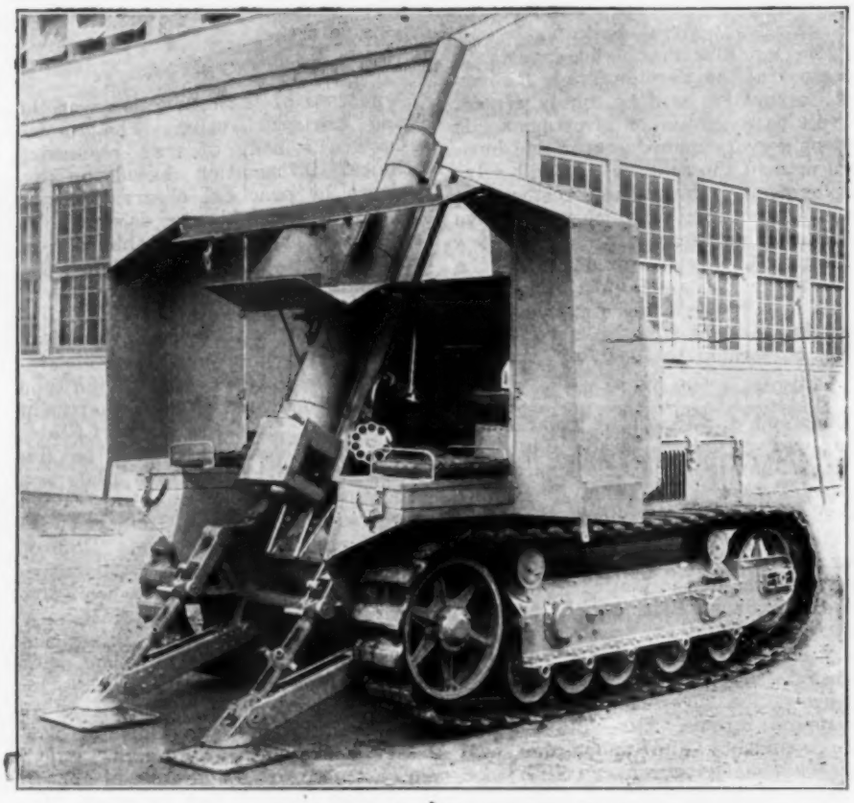
The properties of the Gulf State Steel Co. are located in Alabama.

The Truth About Austin Bros.

That a recent news story published in newspapers in the Southeast and originally emanating from New York to the effect that Austin Brothers, of Atlanta, Ga., would begin the erection within the next thirty days of a structural steel plant in Atlanta to cost $1,250,000 was unauthorized and greatly exaggerated, is the statement made by J. K. Barcroft, president of the company. The story stated the information was furnished by the New York headquarters of the corporation. As a matter of truth Austin Brothers' headquarters are in Atlanta and no permanent office is maintained elsewhere. As previously reported in *American Machinist* the company recently purchased a site near Fort McPherson, in Atlanta, where a structural steel plant will be erected, but it will not be on the extensive scale as was reported.

New Holt Tractor Gun Proves Success on First Official Tryout

The illustration shows a view of the latest development in U. S. Army artillery equipment. It is a 105-mm. howitzer mounted on a tractor which can travel over highways at a speed of 25 miles per hour. The gun and its mounting complete weighs 6½ tons. A caterpillar tread is used, the width of the track being 12 in. and the length of the ground contact 81 in. The driving mechanism is similar to that with which the army tanks were equipped, except that rubber is used on the sprockets and plates to reduce the vibration of high-speed travel. The new gun, which is reported to have made a very creditable showing in the tests at Fort Winfield Scott, San Francisco, Cal., was made by the Holt Manufacturing Co., of Stockton, Cal. Mount and gun together worked equally well. Shots were fired horizontally without budging the tractor, and other shots fired in the air at "65" elevation, considered anti-aircraft shots, were equally successful. It will be sent to Washington to be given a final ordnance test at the government testing grounds, Aberdeen, Md. The gun was designed by Pliny Holt.



"PLINY HOLT BOOSTER" TRACTOR GUN

France Suffers from Business Stagnation

BY A CORRESPONDENT IN PARIS

At the present moment France is going through a very severe crisis from an industrial point of view. Last July the automobile manufacturers commenced to note that business was going off at an alarming rate. This state of affairs continued and was even accentuated right on to the present moment. The consequence was that a panic occurred and most of the automobile manufacturers tried their utmost to cancel the material and machinery which they had on order. This caused the stocks of all the machine-tool merchants to be increased to very large amounts, as at that time they preferred to accept cancellation rather than risk their machines not being paid for, and also to preserve good business feeling with the automobile concerns. The crisis among the automobile firms spread to the general engineering trade, and at the present moment stagnation is prevalent all over France, Switzerland and Spain and other countries.

In addition to large stocks being held by all the machine tool merchants the French government has hundreds of machine tools which it took over from the American Expeditionary Force. These machines are lying in different depots all over France (there are 4,000 tons in one depot at Valenciennes) and are a constant source of trouble to us in our business. With a normal trade I consider that there are enough machine tools in this country at present to supply France's needs for the next few years. We are also having very strong competition with German manufacturers, who up to just recently have been offering machines at prices which are 50 per cent cheaper than those at which we can offer American-built machines. This is easily understandable when one compares the two rates of exchange. The latest political developments between the Allies and Germany will probably tend to cut out some of this German competition.

FINANCIAL DIFFICULTY

From a financial point of view France is in difficulties, as she has advanced large sums of money to industrial concerns in the devastated areas to allow them to rebuild their workshops and to provide them with new machinery. This financial help should have been met promptly by the reparation payment of Germany, but up to the present, as you know, Germany has practically paid nothing, which leaves France with the burden of her invaded districts' financial load, in addition to her pension obligations.

I cannot hold out any great hopes of a large flow of business in our territory for American machine tools in the near future. If it were possible for England and France to trade with Russia my opinion is that trade would recover much quicker than it shows any signs of doing at the moment.

Business Items

The Michigan Tool Co., Detroit, Mich., has moved into its own building at 147 Jos. Campeau St., at Atwater St. This company will have in its new quarters 15,000 sq.ft. of floor space.

Rome Iron Mills, Inc., announces that on and after April 20 the general offices will be located in the National City Building, 17 East 42d St., New York City.

The International Pulverized Fuel Corporation announces that on and after April 20 its general offices will be located in the National City Building, 17 East 42d St., New York City.

The Superheater Co. announces that after May 1 its general offices will be moved from 30 Church St. to 17 East 42d St., New York City.

The American Electric Fusion Corporation, Chicago, Ill., has recently been organized and incorporated with a capital of $50,000 to engage in the manufacture of electric welding machinery of the resistance type. The company has already developed the first series of a line of spot-welders and contemplates expanding to cover a complete line of apparatus. The officers of the company are: President, Edmund J. Henke; vice-president, Edgar Littman of St. Louis; secretary and treasurer, S. G. Taylor, Jr., and director of sales, Arthur B. Sonneborn. The plant of the company is temporarily located at 1906 N. Halsted St., Chicago, Ill., pending erection of a factory.

The Engineering Business Exchange conducted by Charles Whiting Baker announces the opening of a southeastern branch, with offices in Washington, D. C., which will be under the direction of Marshall O. Leighton, who during the past three years has rendered valuable service to the engineering profession as the chairman of the National Service Committee of Engineering Council. Associated with Mr. Leighton in carrying on the exchange will be A. C. Oliphant, who has also been active in the work of the National Service Committee. The southeastern branch will co-operate with the main office of the exchange in New York City but will have especial charge of the territory from Maryland to Alabama, inclusive. The former work of Messrs. Leighton and Oliphant in the Washington office of Engineering Council will be transferred to L. W. Wallace, secretary of the Federated American Engineering Societies. Mr. Wallace will probably be in the Washington office after April 15.

"The Peeves" variable speed transmission and the "Peeves" wood split pulley are now handled in the New York territory by the Standard Supply and Equipment Co., 71 Murray St., New York City. The "Peeves" products were formerly represented by Paterson, Gottfried & Hunter, Inc. A very complete stock of both of these products will be installed by the Standard Supply and Equipment Co., as well as a complete assortment of repair and replacement parts. W. L. Garcia, formerly head of the power transmission department of Patterson, Gottfried & Hunter, will continue in his relationship with "The Peeves" products with the Standard Supply and Equipment Co.

The Boston Gear Works announces the opening of a Cleveland branch office at 803 Superior Ave., N. W., with a complete line of standardized commercial gears.

The Keller Pneumatic Tool Co. announces the removal of its Chicago branch to larger and more up-to-date salesrooms and service station. After May 1 this branch will be located on the main floor in the Transportation Building, 624 South Dearborn St., Chicago, where a complete stock of tools and parts will be maintained. J. C. Campbell, district manager, will be in charge.

The National Auto Top Co., Inc., 808 West Broad St., Richmond, Va., contemplates the installation of machinery for the manufacture of metal automobile bodies, etc.

J. V. Hughes & Co., Johnstown, Pa., recently organized with a capital stock of $250,000, has purchased the four-story brick building on Vine St. and will begin at once the manufacture of toys, novelties and household articles of all kinds. New machinery is now being installed.

To establish a factory which will include a foundry and machine shop for the purpose of manufacturing a newly invented automobile rim, and other automobile parts and accessories, the Brown Manufacturnig Co. has been organized and incorporated with $100,000 capital, by a group of well known business men of Brunswick, Ga. Sam E. Brown, inventor of the new rim, heads the company, and associated with him as incorporators are J. E. Lambright, M. B. McKinnon, E. W. Butts, W. T. Grimes, W. S. Nathan and C. Z. Walker. It is announced by officials of the corporation that the new plant is to be immediately established at Brunswick.

A group of business men headed by W. H. Weatherly, president of the First National Bank of Anniston, Ala., and including interests at Memphis, Tenn., and Cincinnati, Ohio, recently organized the Anniston Electrical Steel Corporation and took over the Anniston Steel plant, comprising about 40 acres of buildings and three miles of standard gage railway. Mr. Weatherly is president of the new corporation. Other officers are G. G. Illingsworth of Cincinnati, vice-president and general manager; W. S. Hotchkiss of Memphis, treasurer. The steel foundry and shops and the forge department of the big plant are to be extensively improved and enlarged immediately, and the program of the new corporation calls for the enlargement of the whole plant during the next year or so. Operating at capacity the plant employs 1,500 workers.

The Merchants Shipbuilding Corporation, with a six-million dollar plant at Chester, Pa., is now engaged in general engineering lines, embracing steel construction work, manufacturing and power plant equipment, machinery and railroad work. A license has also been granted to build the Diesel engine. J. L. Ackerson is in charge of operations.

The Fosdick Machine Tool Co., of Cincinnati, Ohio, maker of high-grade heavy-duty radial and upright drills, has taken over all patents, drawings, patterns, jigs and fixtures covering the line of Pierle quick change high-speed ball bearing sensitive drill presses from the R. K. Le Blond Machine Tool Co. This acquisition by the Fosdick Company will give it a complete line of drilling machinery, consisting of heavy-duty radial drills, heavy-duty upright and gang drills, and high-speed sensitive single and multiple spindle drills.

The Consolidated Tool Works, Inc., of New York, announces the removal of its general offices and warehouse to 296 Broadway.

The Alvord Reamer and Tool Co., Millersburg, Pa., opened a branch office in Chicago at 546 W. Washington Boulevard, and will carry a complete stock of its manufactured articles. T. J. Davis, C. E. Block and C. B. Cole are identified with this branch office, Mr. Cole acting as manager.

Personals

J. ARTHUR DEAKIN announces that he is open to represent in New York or for export, a well-known American machinery company. Mr. Deakin is the American representative of Isbecque, Todd & Co., of Brussels, Belgium. The New York office is located at 150 Nassau St.

CLARENCE A. EARL, former general manager of the Corbin Screw Corporation, has been elected president and general manager of the Briscoe Motor Corporation, Jackson, Mich.

GOVERNOR JAMES HARTNESS, of Vermont, has been presented with the John Scott medal, in recognition of his invention of the flat turret lathe, used in making artillery. The award was made by the American Philosophical Society, at Philadelphia, Pa.

DR. ALBERT SAUVEUR, professor of metallurgy at Harvard University, has been elected to honorary membership in the American Society for Steel Treating. Dr. Sauveur, a native of Belgium, has been a pioneer in metallographic research, having edited and published several papers and books on this subject.

F. W. MCINTYRE has been appointed general sales manager of the Reed-

Prentice Co., Becker Milling Machine Co. and Whitcomb-Blaisdell Machine Tool Co., of Worcester, Mass., succeeding J. P. Ilsley, who has resigned to accept a position with the Taylor Steel Construction Co., of New York City. Direct sales offices of the three companies are maintained in New York, Detroit, Cleveland, Indianapolis and Worcester. The Dale Machinery Co. has been appointed sales agent in the Chicago territory. Normoyle & Lapp, 514 Liberty Building, Philadelphia, have been appointed sales agent in the Philadelphia territory. Under the direction of F. O. Hoagland, general manager, improvements in the present product and in new lines are being developed.

A. R. JACKSON, superintendent of the William Galloway Co., Waterloo, Iowa, has accepted the position of general superintendent with the George B. Miller & Son Co., manufacturer of farm implements at Waterloo, Iowa. Mr. Jackson will have complete charge of production.

HOWARD BRYAN of the educational department of the Hart-Parr Co., Charles City, Iowa, has returned from a three months' sojourn in the Philippine Islands in the interests of the Hart-Parr tractor.

RICHARD A. SCHULTZ, manufacturer of motor truck axles, Chicago, Ill., has recently incorporated under the state laws of Illinois and is operating under the name of the R. A. Schultz Manufacturing Co. The company also manufactures thrust and "Radax" ball bearings.

EDWARD C. MCSHEEHY has resigned as manager of the David A. Wright Machinery and Equipment Co., Chicago, Ill., effective May 1. After that date he will represent the Steel and Tube Co. of America, and the Mark Manufacturing Co. of Chicago, in the Colorado, Wyoming and Montana oil fields, having headquarters in Denver. He is well known to the oil operators in that section, having been connected with the Mine and Smelter Supply Co. of Denver for a number of years.

J. P. ILSLEY has resigned as general sales manager of the combined Reed-Prentice Co. of Worcester, Mass., the Whitcomb-Blaisdell Machine Tool Co. of Worcester, Mass., and the Becker Milling Machine Co. of Hyde Park, Mass. Mr. Ilsley has accepted a position with the Taylor Steel Construction Co. of New York City.

W. H. RASTALL, trade commissioner attached to the Department of Commerce, returned on May 1 from a three-year tour of the Far East. He investigated markets for American industrial machinery and has some interesting facts to present. Manufacturers interested in the Far East may communicate with Mr. Rastall at 307 Custom House, San Francisco, Cal.

RAYMOND C. FULLER, formerly with the Federal Shipbuilding Co., Kearney, N. J., is now attached to the engineering department of the Sperry Gyroscope Co., Brooklyn, N. Y.

Obituary

LORENZO G. SUSCIPJ, whose good fellowship and kindly cheer distinguished him among advertising men, succumbed to a short and unexpected attack of pneumonia on April 23 at his home in Mt. Vernon, N. Y. Mr. Suscipj was born in Rome, Italy, 45 years ago, of an old and prominent Italian family. In 1902 he came to the United States and began forthwith his advertising career. His training was received in newspaper work in Syracuse. After five years he went to Chicago to enter the employ of the Union Carbide Co. and later became assistant advertising manager. In 1917, when Murray, Howe & Co. secured the account of the interests with which Mr. Suscipj was affiliated, he saw the opportunity to enter an organization where he could give the benefit of his experience. He was appointed secretary and contract manager of the company, which post he occupied until his death. Mr. Suscipj was a member of the New York Advertising Club and the Mt. Vernon Country Club. Services were held at his home in Mt. Vernon on Sunday, April 24, his body being removed for interment to Cincinnati, the home of Mrs. Suscipj, his only surviving kin in America.

ALFRED L. LINCOLN, for many years president and general manager of the Lincoln Twist Drill Co., Taunton, Mass., died on Feb. 2. He had been interested all his life in the manufacture of twist drills. He retired from active business in 1917.

JOHN A. BAKER, formerly connected with the Mesta Machine Co., of Pittsburgh, as assistant general superintendent, has been appointed works manager for the Los Angeles plant of the Rich Steel Products Co.

Trade Catalogs

Porcelain Enameling. Chicago Flexible Shaft Co., Chicago, Ill., Catalog No. 80. This catalog describes porcelain enameling methods and furnace construction, both from the metallurgical and the practical shop standpoint, and is a compilation of exceptionally useful information.

Simonds Steel. Simonds Manufacturing Co., Lockport, N. Y. Catalog No. 121. Ninety-three 4½ x 7-in. pages, replete with halftone illustrations, charts, tables, specifications, and bound in leather covers. A well-presented description of the product of the Simonds company and the equipment used in its manufacture.

The Abbott Burnishing Process by Means of Steel Balls. The Abbott Ball Co., P. O. Box, 1233, Hartford, Conn., Catalog 104-T, 23 pages, 4 x 9 in., describes the Abbott burnishing process for all sorts of metal parts by means of special tumbling barrels in combination with steel balls.

Air Compressors. Sullivan Machinery Co., Chicago, Ill. Bulletins 77A and 77B, describing the Sullivan angle-compound power-driven air compressors and the portable mine-car air compressor. The bulletins are complete with illustrations and specifications.

Utility Tools. J. C. Glenzer Co., Detroit, Mich. Thirty-one 4 x 9-in. pages covering the line of cutting tools and fixtures put out by this company. Some of the tools described are counterbores, spot-facers, reamers, countersinks, core-drills, sleeves, etc. A special feature is the unique arrangement of pages in the center of the catalog which illustrates the interchangeability of the Utility system.

Drill Sharpeners. Sullivan Machinery Co., Chicago, Ill. A thirty-two page 6 x 9-in. catalog describing a line of drill sharpeners for hammer-forging drill bits and shanks.

Crane Cages. Pawling & Harnischfeger Co., Milwaukee, Wis. Describing the latest model of P & H crane cage, which embodies such new features as front lever operated controllers and all-enclosed switchboard and control.

Drop Hammers. Standard Machinery Co., Auburn, R. I. Represented by the Brownell Machinery Co., Providence, R. I. Twelfth edition of a 6 x 9-in. catalog describing and illustrating a complete line of presses of all kinds, rolling mills, wire drawing machinery, swaging machines, roller and ball bearings.

Oil and Gas Burners. W. S. Rockwell Co., 50 Church St., New York, N. Y. Bulletin No. 223, illustrating and describing various types of burners for use of oil and gas fuels for industrial heating.

Oil Hole Covers. W. W. & C. F. Tucker, Hartford, Conn. Catalog No. 6, twenty-one 4 x 6-in. pages, showing several new models of oil hole covers. Tables of sizes, specifications and price lists for all types are included.

Electric Hoists. Northern Engineering Works, Detroit, Mich. Bulletin No. 543, illustrating miscellaneous types of electric hoists.

"Reamers at Work." A booklet pubished by the Gisholt Machine Co., Madison, Wis., showing the solid-ajdustable Gisholt manufacturing reamer at work in the shop. Specifications and working data are included.

Rotary Pumps. Blackmer Rotary Pump Co., Petoskey, Mich. A four-page circular illustrating and describing several types of "Black-Mer-Maid" rotary pumps.

Forthcoming Meetings

A triple convention of the National Supply and Machinery Dealers' Association, the Southern Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association will be held in Atlantic City, N. J., May 16, 17 and 18, 1921, with headquarters for all three associations at the Marlborough-Blenheim. F. D. Mitchell, 4106 Woolworth Building, New York, is secretary of the last-named association.

The spring meeting of the National Association of Manufacturers will be held in New York, May 16, 17 and 18 at the Waldorf-Astoria Hotel. The headquarters of the association is at 30 Church St., New York City.

The Taylor Society will hold its Spring Meeting at the Hotel Statler, Cleveland, Ohio, May 19 to 21.

The spring meeting of the American Society of Mechanical Engineers will be held at the Congress Hotel, Chicago, May 23-26. Calvin W. Rice, Engineering Societies Bldg., 29 West 39th St., New York, is secretary.

The Society of Automotive Engineers, 29 West 39th St., New York announces that its summer meeting will be held at West Baden, Ind., on May 24 to 28 inclusive.

The American Railway Master Mechanics Association will hold its Spring Meeting at the Drake Hotel, Chicago, Ill., on June 15 and 16.

The 1921 annual meeting of the American Society for Testing Materials will be held at Asbury Park, N. J., on June 20 to 24, with headquarters at the New Monterey Hotel. C. L. Warwick, Engineers Club, Philadelphia, Pa., is secretary.

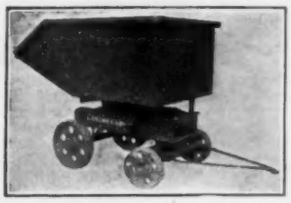
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Trailer Car, Scoop-Body

Easton Car and Construction Co., 50 Church St., New York, N. Y.

"American Machinist," Feb. 24, 1921



The body is mounted on a structural-steel turntable and may be dumped from any one of the four sides. The wheels are equipped with roller-bearings. The low height of the car makes it convenient for hand loading. The car can be used for handling such materials as sand, coal, castings, cinders and metal chips. It is equipped with flat-tread instead of narrow-gage-track wheels, not being confined to the limits of a track system. It can be handled by one man, where single cars, either hand-pushed or pulled, can be employed. The capacity of the car is 27 cu.ft.

Platform, Lift-Truck, Pressed Steel

Powell Pressed Steel Co., Hubbard, Ohio

"American Machinist," Feb. 24, 1921

The platform is made of one piece of sheet steel and is formed by a cold process, which sets the material to the form required. The height, or inside clearance, of the platform is generally from 6½ to 12 in. The corrugations used to strengthen the platform are 1½ in. wide by ¾ in. deep and spaced at 6-in. centers. It is stated that a platform made of No. 9 gage steel will easily carry from 15,000 to 20,000 lb., and may be overloaded considerably, that the life of a platform is practically endless, and that no repairs are required. Racks or boxes may be built onto the platform, and to provide a large flat top a sheet-metal plate is spot-welded to the top of the platform.

Centers, Fluting, Multiple-Spindle, No. 2½

Miller & Crowningshield, Greenfield, Mass.

"American Machinist," Feb. 24, 1921

The device is intended for use on the table of a milling machine when fluting taps or reamers, and it consists of an indexing head and a tailstock. It can be furnished with either three or four spindles, the same range of work being handled in each case. The spindles can be turned simultaneously in the same direction by means of the crank. The indexing for any number of flutes up to 20 can be done by means of a single full turn of the indexing handle, change gears being provided to vary the ratio. The spindles are clamped simultaneously by means of one handle. The tailstock is separate from the head, being made either solid or with separate vertical adjustment for each center. Either round or square stock can be held.

Charger, Storage Battery, Automatic, for Electric Industrial Vehicles

Acme Electric and Manufacturing Co., Cleveland, Ohio

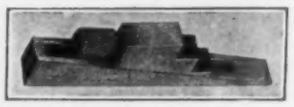
"American Machinist," Feb. 24, 1921

The device is intended to charge the battery at the rate recommended by the battery manufacturer. The charger takes up a little more than a square foot of floor space. Its motor is built for heavy service, and the generator is constructed to suit the battery. The shaft is one solid piece, rotating on ball bearings, the dynamically balanced armature and rotor both being mounted on it. The commutator has a large radiating surface and maintains a low operating temperature. Cool operation is afforded by a Sirocco-type fan, which ventilates the machine by drawing air through the windings. An automatic operating panel accompanies the charger. It is made of rubber-finished electrical slate mounted on an angle-iron frame, and contains the instruments and switches.

Block, Size, Adjustable

M. B. Hill, 10 Eden St., Worcester, Mass.

"American Machinist," Feb. 24, 1921

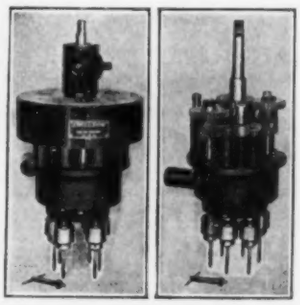


The block is adjustable in size and intended for use in setting cutting tools to height above a surface. It is made of carbon steel, hardened and ground all over, and the sliding surfaces are lapped. In the inclinded surface of the larger piece is a T-slot, in which slides a small T-head stud that extends up into the hollow sliding member. A tapered hole in the upper end of this stud receives the correspondingly pointed end of the knurled-head screw, a turn of which serves to clamp the sliding member in any position. The setting is, of course, measured by means of a micrometer over both members.

flead, Tapping, Multiple-Spindle

John H. Dorman & Son, 5148-52 Hudson Blvd. West, West New York, N. J.

"American Machinist," Feb. 24, 1921

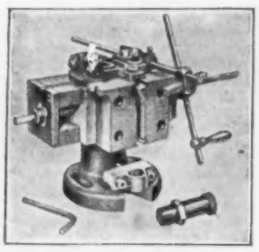


The device is intended for tapping simultaneously six holes grouped together, the holes not lying on the circumference of the same circle. The head at the left is completedly assembled, while the housing has been removed from the head in the view on the right. The gears driving the tapping spindles are compounded, the driving spindle carrying two gears of different sizes. In this way the taps can be given the same speed of rotation, although they are placed at different distances from the center line of the driving spindle. It is possible also, to vary the speeds of the different spindles by means of the gearing, so that taps of different pitch can be used at the same time. The direction of rotation reverses automatically when the head is raised.

Chuck, Universal, Drilling Machine

John Chuck Co., Milwaukee, Wis.

"American Machinist," Feb. 24, 1921



The device is intended to be used for holding work while performing such operations as drilling, milling, grinding and tapping, being employed chiefly on the tables of drilling machines. False jaws are made to conform to the work. An adjustable arm is furnished to hold the stop. The jaws are operated by means of a right- and left-hand screw, thus being self-centering. The screw is of high-grade steel and provision is made for takng the end thrust. A handle is provided, by which the screw can be operated from either end of the chuck. The body and crossheads of the chuck are made of cast iron. Provision is made for taking up the wear on crossheads. Extension bases can be furnished for long work.

Grinding Machine, Surface, High-Duty, Type C

Diamond Machine Co., 9 Codding St., Providence, R. I.

"American Machinist," Feb. 24, 1921

The machine is intended to do small work, although it can handle pieces up to 10 in. wide, 24 in. long and 8 in. high. It is made much heavier than the usual small surface-grinding machine, so that rigidity and freedom of vibration may be obtained. The machine has individual motor drive, the motor being a component part of the machine and standard in all respects. The wheelhead is cast integral with the vertical column, the combined column and head being adjusted vertically to suit the thickness of the work. The ways are completely covered by metal guards. The traverse is automatic, and adjustable from 0.001 to 0.020 in. per stroke.

Clip, paste on 3 x 5-in. cards and file as desired

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Threading Machine, Two-Spindle, ¾-In.
Geometric Tool Co., New Haven, Conn.
"American Machinist," March 3, 1921

The bed of the machine carries two spindles, which are mounted in large bronze bearings. The spindles are driven by a single pulley, located at the rear of the machine, but may be operated and controlled independently by means of the change gear levers at both sides of the machine. The speeds are indexed according to the size of work being handled, but may be varied. Both spindles may be fitted with die heads for external threading, or may be fitted with taps for internal threading. Or, one spindle may carry a die head and the other may carry a tap. Each carriage is fitted with a two-jawed chuck operated by a hand-wheel. A single-geared pump forces oil through the spindle and die head against the work. The machine will cut U. S. Standard thread to ¾ in. in diameter.

Screw Machine, Automatic, Four-Spindle
Cone Automatic Machine Co., Windsor, Vt.
"American Machinist," March 3, 1921

Changes in the design have altered the appearance of the machine to a considerable extent, although the principle of the Cone automatic is retained in the present design. The frame carrying the camshaft rests upon uprights that are a part of the lower frame and that carry the spindle turret and driving mechanism. The upper frame furnishes the support for two auxiliary spindles, while two other spindles are carried upon the turning tool-slides, making four independently driven auxiliary spindles. The turning tools are supported by slides that have bearings directly upon the bed of the machine and travel in a direction parallel to the work. The machine is built in three sizes, the one shown handling bars up to 1¼ in. in diameter and producing pieces 6 in. long. Floor space, about 6 by 8½ ft. Shipping weight, 8,000 lb.

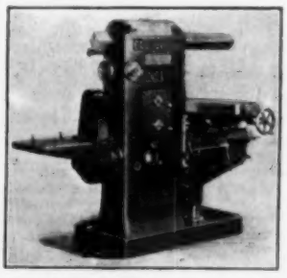
Drilling Machines, Sensitive, High-Speed, "Pecorp"
Providence Engineering Corporation, Providence, R. I.
"American Machinist," March 3, 1921

The machine was formerly made by the A. C. Mason Co., Inc., Paterson, N. J. It is built in both bench (Model E) and floor (Model F) types and with either one, two, three, four or six spindles, the illustration showing a multiple-spindle floor-type machine. It is fully equipped with ball bearings, and the bearings and moving parts are covered, the only visible rotating parts being the driving pulley and the nose of the spindle. The spindle is provided with a device for retaining the lubricating oil, a reservoir being incorporated in the sleeve. Oil which has passed through the lower bearings on the spindle is caught, when thrown outward, by the interior surface of the non-rotating sleeve, and then drops downward from the bottom of the sleeve, thus protecting the operator. Holes ⅛ in. in diameter can be drilled in steel.

Shaper, Crank
Samson Works, Berlin, Germany
"American Machinist," March 3, 1921

The gear for the link drive and its journal are made in two separate parts, the journal being of steel, hardened and ground. The coupling of the link and ram is pivoted. The ram runs between two steel gibs. The adjustment of the table feed is made by means of a pawl. The feed during reversal of the ram is actuated by two cams fitted on the main drive gear, and is transformed into the reciprocating rotation of a vertical feed shaft by means of a completely encased train of spur and bevel gears. Forced lubrication is provided for all main parts, by means of a pump feeding a constant jet of lubricant.

Milling Machine Drive, Individual Motor, Cleveland
Clark Mesker Co., 18511 Euclid Ave., Cleveland, Ohio
"American Machinist," March 3, 1921



The motor bracket and drive mechanism are built in two sizes, to fit the Nos. 1 and 2 milling machines. It is claimed that this direct-connected motor drive obtains the advantages of belt-driving by the incorporation of a friction clutch between the lower sprocket and the main drive-shaft. The grip of the clutch can be adjusted by a nut at the back of the clutch housing. The drive can be applied to the present models of belt-driven machines. The bracket is designed to support the motor high enough, so that it be free from the dirt of the floor. The sprockets and chain run in a bath of oil. A 2-in. Morse chain is used on the No. 1 machine, and a 2½-in. chain on the No. 2. The motor has a constant speed and runs at 1,200 r.p.m.

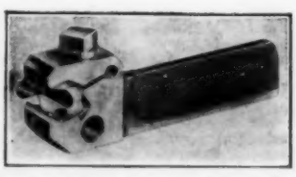
Rivet-Heating Machine, Electric
Elektrische Schweissmaschinen Gesellschaft, Charlottenburg 4, Germany
"American Machinist," March 3, 1921

The machine is intended for use in the erection of steel structures, and for boiler shops, shipyards and other industrial plants. The transformer is placed on a cast-iron table resting on legs equipped with rollers. In the front of the transformer are the electrodes. The regulating switch has six steps and is encased and mounted in the rear. The switching on and off of the current, and the movement of the electrodes for feeding and removing the rivets are actuated by the treadle. The machine is fed by a weak medium-tension alternating current, which is converted into a very strong low-tension current. This latter current passes through the rivet, which is put between the electrodes and is heated in a few seconds. The machine is made in two sizes, for rivets up to ¾ and 1¼ in., respectively. The smaller size of machine heats 400 rivets per hour.

Boring Tool, Small
M. B. Hill, 10 Eden St., Worcester, Mass.
"American Machinist," March 3, 1921

The tool is suitable for use in small lathes. The toolbar is held to the shank by a swinging link that permits it to be raised and lowered, to accommodate various heights of center, without throwing it out of parallel. The link is simultaneously tightened upon the stud and upon the toolbar by means of a single screw. Three toolbars are provided with each holder. A split bushing is furnished to adapt the holder to a smaller size of toolbar. Extra bars can be made from drill rod.

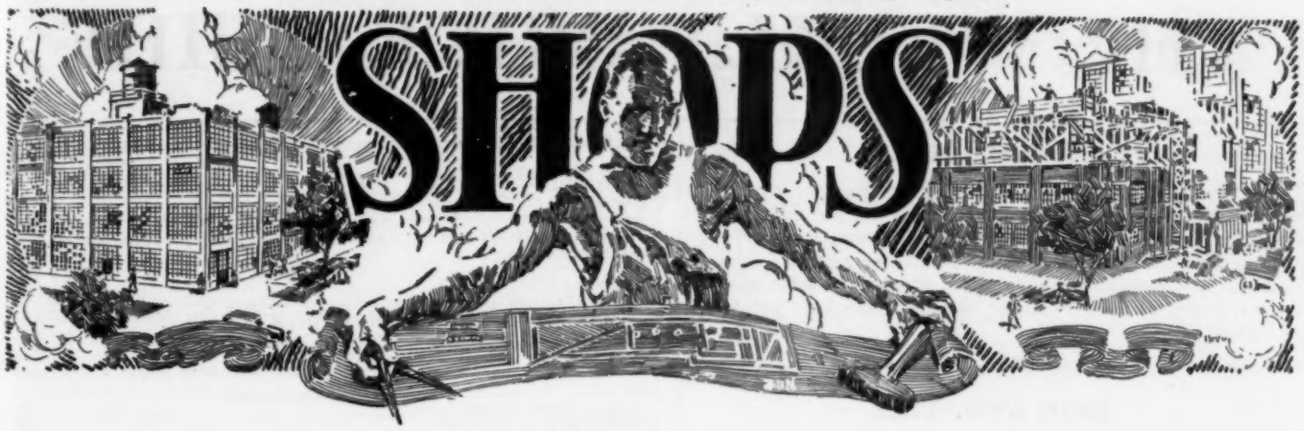
Tool and Holder, "Twisto"
John H. Monstream, Hartford, Conn.
"American Machinist," March 3, 1921



The device is intended for use on lathes, planers and shapers, being adapted to general machining work. The cutting tool or bit resembles a three-lipped twist drill, it being provided with three helical grooves. The cutting is done on the ends of the bit, one edge cutting at a time. The bits are regularly furnished in lengths of 2 in., it being stated that there are 6¾ in. of length of cutting lip available for wear on each bit. When sharpening the tool, only the ends of it are ground. The bit is clamped in the holder in a horizontal position, a long bearing being provided in the holder, so that the bit is securely held. The holder is adapted to the use of disk tools. The shank of the tool passes through the hole used for the "Twisto" tool, and a stud passed through the lower hole in the holder serves to steady the edge of the disk.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools Wanted

If in need of machine tools send us a list for publication in this column

R. I., Hillsgrove — The Providence Fittings Co., G. F. Bullard, Pres.—Six or eight in. single or double acting air cylinders, Garvin preferred but similar type would be considered, (new or second hand).

R. I., Providence — D. Marandola, 1275 Pleasant St. — repair equipment for proposed garage and service station.

Md., Baltimore — S. T. Williams, 223 North Calvert St., (mechanical engr.)—heavy engine lathe, to swing 18 to 20 n. over bed and take 6 to 8 ft. between centers, also suitable chuck with lathe, Lodge & Shipley, Amer. Tool Co. or similar make, preferred.

N. Y., Binghamton — E. H. Titchener & Co., manufacturer of wire goods—inclinable power press similar to Bliss No. 20.

N. Y., Buffalo—The Warner Jewelry Case Co., 648 Michigan Ave. — machinery for manufacturing jewelry cases including presses, etc.

N. Y., New York (Borough of Manhattan)—The Automatic Straight Air Brake Co., 210 11th Ave.—
Jones & Lamson turret lathe.
No. 2A Warner & Swasey turret lathe.
No. 4 Warner & Swasey turret lathe.
No. 2V O. & J. milling machine.
No. 2H Becker profiler.
No. 25 Becker milling machine.
Pratt & Witney multiple drill
Single spindle sensitive drill press.
Two spindle sensitive drill press.
Four spindle sensitive drill press.
Six spindle sensitive drill press.
2½ Garwin tapping machine.
No. 6 Heald grinder.
One 4 in. x 12 in. tool room lathe.
Bench lathe.

N. Y., New York (Borough of Manhattan)—The Florida East Coast Ry., 120 Bway.—foot power squaring shears.

N. Y., New York (Borough of Manhattan)—The Imperial Japanese Navy, 1 Madison Ave.—
One 12 ft. x 24 in. Rahn Larmon lathe, series "D" three step cone, double back gear, quick change gear, etc.
Six 24 in. x 10 ft. Rahn Larmon lathes, three step cone, double back gear, quick change gear, etc.
Two 14 in. x 6 ft. Greaves Klusman lathes, double back gear, three step cone, quick change gear, etc.
Two 14 in. x 6 ft. Porter lathes, double back gear, four step cone, quick change gear, etc.
Seven 16 in. x 6 ft. Greaves Klusman lathes.
Seven 16 in. x 6 ft. Porter lathes.
Two No. 7 Porter turret lathes.
One 2 spindle Allen sensitive ball bearing drill press.
One 4 ft. Carlton style "G" radial drill.
One 5 ft. Carlton new model ball bearing radial drill with speed box drive and plain table.
One 2 spindle 20 in. Washburn sensitive ball bearing drill press complete with countershaft.
Three 32 in. Rochford mechanics sliding head drill press.
One Capital internal grinder, capacity ⅜ in. to 2 in. x 2 in., table dimension 36 in. x 7 ft.

N. Y., New York (Borough of Manhattan)—The Machinery Engr. & Sales Co., 299 Bway.—one 6 ft. x 14 in. engine lathe and power presses, all sizes.

N. Y., New York (Borough of Manhattan)—The Standard Oil Co., 26 Bway.—one No. 2 Cleveland plain milling machine with arbor and regular equipment including plain, vise, belt guard, etc.

Pa., Beaver Falls—The Traver Eng Co., H. G. Traver, Pres.—small punches, large punch and shears.

Pa., Pittsburgh—W. C. Davison Gas Burner & Welding Co., 3145 Penn Ave., F. F. Davison, Mgr.—one 24 in. turret lathe and one No. 3 milling machine.

Pa., Pittsburgh—The Pittsburgh Gauge & Supply Co., 30th and Liberty Aves., manufacturers of electric household, mine and mill supplies, F. B. Lippincott, Purch. Agt.—No. 3 milling machine, automatic nailing machine and acetylene welder.

N. C., Wilmington—Carter's Production Wks., 2?0 South Water St., manufacturer of machinery, O. Carter, Mgr.—
One drop end, power driven plate roll, 17 ft. between housings.
One 8 to 10 ft. boring mill.
One 42 x 42 planer.
One rotary plate shear which will cut plate ⅜ in. thick.
One bevel shear which will cut plate ½ in. thick.

Miss., Kosciusko—The Planters Oil Mill & Gin Co., J. O. Ashworth, Supt.—one 18 in. x 14 ft. engine lathe, (used and in good condition), 20 in. x 24 in. drill press and small crank shaper.

Ill., Chicago—O. C. Harrington Co., 4134 Fillmore St., manufacturer of auto accessories—small punch press.

Ill., Chicago—The J. H. Smith & Sons Co., 3541 Cottage Grove Ave.—foot power squaring shear.

Mich., Detroit — F. J. Whitney, 5955 Grand River Ave.—equipment for proposed garage and service station.

O., Cleveland—The Machine School, 2122 Prospect Ave.—punch presses, No. 2 and No . (used).

Wis., Cudahy — J. Wagner, 901 Layton Ave.—12 in. lathe, drill press to drill 1 in. hole and emery wheel for garage.

Wis., Milwaukee—J. J. Biedrzycki, 684 3d Ave.—lathe of size adaptable to auto repair work.

Wis., Milwaukee—M. D. Newald & Co., 201 Bway., manufacturer of motor trucks, M. D. Newald, Purch. Agt.—18 in. lathe, 20 in. drill press and small bench drill press.

Wis., Milwaukee — The Nordstrom Vulcanizer Co., 2706 St. Paul Ave., C. Nordstrom, Purch. Agt.—4 grinders equipped with buffers and 1 drill press to drill ⅜ in. hole.

Wis., Milwaukee—W. A. Stidemann, 1266 South Pierce St., manufacturer of metal specialties—punch press.

Wis., New Holstein—Meili-Blumberg Co.—drill press and emery wheel for garage.

Wis., Platteville—The Fiedler Motor Co., E. C. Fiedler, Secy.—drills, lathes, etc.

Wis., Sheboygan — The Globe Co., 824 Penn Ave. — end milling attachment for Cleveland open side planer, 30 in. x 30 in.

Wis., Waukesha — Kendall & Held, 312 Harrison St.—medium size lathe for repair department of garage.

Ia., Cedar Rapids—The Bd. Educ., 705 1st Ave., M. A. Motejl, Secy.—manual training equipment for proposed school here.

Ark., Helena—J. M. Biggs, Box 244, manufacturer of hall clock cases, clock movements and small electrical specialties — wood and metal working machinery including lathes, punch presses and special tools.

Kan., Topeka—J. E. Weekes, Genl. Mgr. of the Weekes Machine Shop, 506 East 4th St.—milling machine.

Ont., Goderich—The Natl. Shipbuilding Co., W. Hutchinson, Mgr.—metal working machinery.

Machinery Wanted

N. J., Woodstown — The South Jersey Farmers Exchange—grinding machine.

Pa., Wayne—W. McClellan—crusher rolls for crushing rock.

Fla., Arcadia—The Tropics Products Co., R. H. Daugherty, Pres.—labeling machines and pasteurizers.

La., New Orleans — J. P. Sutton, 2001 Rousseau St.—complete foundry equipment, cupulo, flasks, electric crane, machine for elevating castings, etc.

Ill., Chicago—The Great Western Laundry, 2125 Madison St.—laundry equipment.

Ind., Elkhart—The Amer. Coating Mills—machine equipment for its paper mill.

Mich., Detroit—The Utility Compressor Co., 1161 East Harper Ave.—miscellaneous equipment for making refrigerators for proposed plant at Adrian.

O., Columbus—The Federal Ice & Refrigerating Co., 20th and Whitcomb Sts.—special ice and refrigerating machinery.

Wis., Kenosha—S. Grotsky, 317 Orange St.—refrigerating and milk separating machinery.

Wis., Racine—The Fox Ice Co., Liberty St., C. Fox, Purch. Agt.—ice making and refrigerating machinery.

Wis., Racine—The New York Market Co., 132 Washington St. — meat handling machinery.

Wis., Rice Lake — The Rice Lake Mfg. Co., manufacturer of sash and doors — woodworking machinery, including mortiser, sticker, etc.

Mo., Springfield—The Forster Mfg. Co.—canning machinery.

Cal., San Bernardino—K. O. Stromee, 465 H St.—machine to turn out wood blocks ⅜ x 1¼ x 1¾ embossed pressed or printed.

THE WEEKLY PRICE GUIDE

This Week's Market

The metal market is practically unchanged from last week. We record a general lowering in pig iron prices. We present the new basing card of discounts on wrought pipe in Pittsburgh. Linseed oil is stronger in Chicago and New York. Cleveland reports steel sheets available at warehouses at prices 15c. less than the new schedule printed on this page.

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.75
Northern Basic	26.52
Southern Ohio No. 2	27.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	34.26
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25–2.75	26.26
Virginia No. 2	*27.00
Basic	†25.00
Grey Forge	*25.00
CHICAGO	
No. 2 Foundry local	24.00
No. 2 Foundry, Southern, sil 2.25@2.75	30.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.46
Basic	24.46
Bessemer	26.96

* F. o. b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York Warehouse Jersey City	New York Delivered	Cleveland	Chicago Delivered
Structural shapes	$3.23	$3.33	$3.09	$3.23
Soft steel bars	3.13	3.23	2.99	3.13
Soft steel bar shapes	3.13	3.23	3.48	3.13
Soft steel bands	4.18	4.28	6.25	
Tank plates	3.23	3.33	3.78	3.23

BAR IRON—Prices per 100 lb. at the places named are as follows:

Mill, Pittsburgh	$2.20
Warehouse, New York, delivered	3.13
Warehouse, Cleveland	3.52
Warehouse, Chicago	3.13

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York,	Cleveland	Chicago
No. 10	3.10	4.25	4.00	4.13
No. 12	3.15	4.30	4.05	4.18
No. 14	3.20	4.35	4.10	4.23
No. 16	3.30	4.45	4.20	4.33
Black				
Nos. 17 and 21	3.75	4.95	4.80	5.20
Nos. 22 and 24	3.85	5.00	4.85	5.25
No. 25 and 26	3.90	5.05	4.90	5.30
No. 28	4.00	5.15	5.00	5.40
Galvanized				
No. 10 and 11	4.00	5.30	5.00	5.70
No. 12 to 14	4.10	5.40	5.10	5.80
Nos. 17 and 21	4.40	5.70	5.40	6.10
Nos. 22 and 24	4.55	5.85	5.55	6.25
No. 26	4.70	6.00	5.70	6.30
No. 28	5.00	6.25	6.00	6.40

COLD FINISHED STEEL—Warehouse base prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb	$4.73	$4.63	$4.25
Flats, squares and hexagons, per 100 lb	5.23	4.63	4.75

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent
New York	65%
Cleveland	50%
Chicago	50%

NICKEL AND MONEL METAL—Base prices in cents per pound, any quantities, f.o.b. Bayonne, N. J.

Nickel	
Ingots and hot	41
Electrolytic	43

Monel Metal			
Shot and blocks	35	Hot rolled rods (base)	42
Ingots	38	Cold rolled rods (base)	56
Sheet bars	40	Hot rolled sheets (base)	55

Special Nickel and Alloys	
Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grade "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods, "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Electric Welding Wire—Welding wire in 100-lb. lots sells as follows, f.o.b. New York: ⅛, 8½c. per lb.; ¼, 8c.; ½ to ¼, 7½c. Domestic iron sells at 12c. per lb.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York	Cleveland	Chicago
Openhearth spring steel (heavy)	5.50	8.00	8.25
Spring steel (light)	8.00	7.00	10.50
Coppered Bessemer rods (base)	8.00	8.00	6.20
Hoop steel	4.28	3.69	3.83
Cold rolled strip steel	8.00	8.25	7.90
Floor plates	5.30	3.09@3.40	5.78

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card of April 13, 1921:

BUTT WELD

Inches	Steel Black	Steel Galv.	Inches	Iron Black	Iron Galv.
1 to 3	62½	50	⅛	33½	18½
			¼ to 1¼	36½	20½

LAP WELD

2	54½	41	2	30½	16½
2½ to 6	58½	45	2½ to 4	34½	22½
7 to 12	54½	44	4½ to 6	33½	21½
13 and 14	45	37	7 to 8	24½	18½
15	42½	32	9 to 12	19½	7½

BUTT WELD, EXTRA STRONG, PLAIN ENDS

1 to 1½	60½	49	1 to 1½	35½	21½
2 to 3	61½	50			

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	52½	41	2	32½	18½
2½ to 4	56½	45	2½ to 4	34½	22½
4½ to 6	55½	44	4½ to 6	33½	21½
7 to 8	50½	37	7 to 8	24½	18½
9 to 12	45½	32	9 to 12	19½	7½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

METALS

MISCELLANEOUS METALS—Present and past New York jobbers' quotations in cents per pound, in quantities up to car lots:

Copper, electrolytic	13.62½
Tin in 5-ton lots	32.25
Lead	5.00
Zinc	5.60
ST. LOUIS	
Lead	4.60
Zinc	5.20

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York	Cleveland	Chicago
Copper sheets, base	20.50	22.00	23.50
Copper wire (carload lots)	15.00	17.50	20.00
Brass sheets	17.25	24.00	24.50
Brass pipe	21.00	22.00	20.75
Solder (half and half) (case lots)	18.00	22.75	17.50

Copper sheets quoted, above hot rolled 24 oz., cold rolled 14 oz. and heavier. add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are in cents per pound at warehouse:

New York	15.25
Cleveland	19.00
Chicago	18.75

SHOP MATERIALS & SUPPLIES

ZINC SHEETS—The following prices in cents per pound are *f. o. b.* mill less 8% for carload lots..... 11.00

	Warehouse	
	In Casks	Broken Lots
New York	12.00	12.50
Cleveland	12.15	12.50
Chicago	15.75	16.25

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

New York	6.00
Chicago	6.25
Cleveland	7.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.00	$9.50
Copper, heavy, and wire	9.00	9.50	8.50
Copper, light, and bottoms	8.00	9.00	7.75
Lead, heavy	3.25	3.50	3.50
Lead, tea	2.00	2.50	3.00
Brass, heavy	6.00	7.00	9.00
Brass, light	4.50	4.50	4.50
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	3.00	3.00	3.00

ALUMINUM—The following prices are spot from warehouse, cents per pound:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	28.4	25.50@26.00	30.00

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current
New York (round)	22.00
Chicago	20.50
Cleveland	22.50

BABBITT METAL—Warehouse price in cents per pound:

	New York	Cleveland	Chicago
Best grade	70.00	42.00	35.00
Commercial	30.00	15.50	9.00

NOTE—Price of babbitt metal is governed largely by formula, no two manufacturers quoting the same prices. For example, in New York, we quote the best two grades, although lower grades may be obtained at much lower prices.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York	Cleveland	Chicago
Hot pressed square	List	$2.00	1.60
Hot pressed hexagon	List	2.00	1.60
Cold punches hexagon	List	2.00	1.60
Cold punched square	List	2.00	1.60

Semi-finished nuts, $\frac{7}{8}$ and smaller, sell at the following discounts from list price:

	Current
New York	60%
Chicago	50%
Cleveland	75-10%

MACHINE BOLTS—Warehouse, discounts in the following cities:

	New York	Cleveland	Chicago
All sizes up to 1 by 30 in	50-10%	60-10%	50%
1¼ and 1½ in. by 3 in. up to 12 in	50%	50-5%	45%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York..... $2.00 Cleveland..... $4.00 Chicago..... $4.00
For cast-iron washers, ¾ and larger, the base price per 100 lb. is as follows:
New York..... $4.50 Cleveland..... $3.75 Chicago..... $4.00

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
¾ by 6 in. and smaller	40%	50-10%	40%
Larger and longer up to 1 in. by 30 in.	40%	50%	40%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets	Burs
Cleveland	40%	10%
Chicago	net	net
New York	40%	25%

RIVETS—The following discounts are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	50%	60%	45%
Tinned	45%	60%	30%

Structural, ¼, ⅜, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:
New York...$4.65 Cleveland...$4.60 Chicago....$4.88 Pittsburgh..$3.70
Boiler, same sizes:
New York...$4.75 Cleveland...$4.70 Chicago....$4.98 Pittsburgh..$3.83

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	22.25	25.00	25.50
Brass	21.00	24.00	24.50

Prices vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities less than 25 lb. add 10c. per lb.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ¼-2 in., inclusive in rounds, and ½-1½ in., inclusive in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $0.75.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $7.70 per 100 lb. In Cleveland—$7.00 per 100 lb.; New York price is 8c.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	Cleveland	Chicago
White	10.00@13.00	12.50	14.25
Colored mixed	7.00@11.50	9.50	12.00

WIPING CLOTHS—Jobbers' price per 1,000 is as follows:

	13½x13½	13½x20½
Cleveland	$55.00	$65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current
New York (5 bbl.)	$2.10
Philadelphia (5 bbl)	1.85
Cleveland	3.25
Chicago	2.50

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current
New York (5 bbl.)	$2.55
Philadelphia (5 bbl.)	2.55
Chicago	4.50

COKE—The following are prices per net ton at ovens, Connellsville:

	Current
Prompt furnace	$3.50@$4.25
Prompt foundry	4.50@ 5.50

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	100-lb. bag	$0.80
Cleveland	100-lb. bag	0.80

LINSEED OIL—These prices are per gallon:

	Current		
	New York	Cleveland	Chicago
Raw in barrels (5 bbl. lots)	$0.70	$0.66	$0.75
5-gal. cans	.73*	0.81	1.00

*Charge of $2.25 for two cans.

WHITE AND RED LEAD—Base price per pound:

	Current		
	Red		White
	Dry	In Oil	Dry and In Oil
100 lb. keg	13.00	14.50	13.00
25 and 50-lb. kegs	13.25	14.75	13.00
12½-lb. keg	13.50	15.00	13.50
5-lb. cans	16.00	17.50	16.00
1-lb. cans	18.00	19.50	18.00

500-lb. lots less 10% discount; 2,000-lb. lots less 10-4% discount; 10,000 lb. lots less 10-7½% discount.

Ont., Durham—The Jackson Mfg. Co.—woodworking equipment and machinery.

Ont., Simcoe — The Osigrow Silk Co. — complete equipment for silk weaving plant.

Que., Montreal—The Canadian Consolidated Rubber Co., Inspector St.—additional machinery.

Metal Working

NEW ENGLAND STATES

Conn., Darien — L. Butler, Boston Post Rd., plans to build a 1 story garage on the Post Rd. Estimated cost, $10,000.

Conn., Hartford—J. P. Murphy, Garden St., has awarded the contract for the construction of a 1 story, 65 x 85 ft. garage on Congress St. Estimated cost, $10,000.

Conn., New Haven — E. Romano, 117 Cedar St., has awarded the contract for the construction of a 1 story, 40 x 65 ft. garage on Howard Ave. and Spring St. Estimated cost, $10,000.

Conn., Plainville—The Plainville Casting Co. has awarded the contract for the construction of a 1 story, 70 x 160 ft. foundry. Cost between $45,000 and $50,000.

Mass., Boston — P. McCue, 29 Speedwell St., has awarded the contract for the construction of a 1 story, 111 x 168 x 182 ft. triangular shape garage on Talbot Ave. Estimated cost, $35,000.

Mass., Cambridge—The city has awarded the contract for the construction of a 1 story, 32 x 155 ft. garage and a 27 x 152 ft. shop building on Hampshire St. Estimated cost, $40,000.

Mass., Chelsea—Pope & Cottle Co., 140 Carter St., has awarded the contract for the construction of a 1 story, 50 x 65 ft. garage. Estimated cost $20,000.

Mass., Gloucester — Perkins & Corliss, Inc., Middle St., have awarded the contract for rebuilding a 2 story garage on Main St. Estimated cost, $40,000.

Mass., Hyde Park (Boston P. O.)—J. S. Coveney, 1087 Hyde Park Ave., will build a 2 story garage. Estimated cost, $10,000.

Mass., Indian Orchard — The Chapman Valve Mfg. Co., Pine St., has awarded the contract for the construction of a 1 story, 50 x 275 ft. addition to its foundry. Estimated cost, $150,000. Noted April 7.

Mass., Springfield—H. G. Fisk, 111 Maple St., has awarded the contract for the construction of a 2 story, 100 x 100 ft. garage on Chestnut St. Estimated cost, $65,000.

Mass., Springfield—The Gulf Refining Co., Albany St., will soon award the contract for the construction of a 1 story garage. Estimated cost, $25,000. Private plans.

Mass., West Springfield (Springfield P. O.)—A. Ballotti, 9 Palmer St., has awarded the contract for the construction of a 1 story garage on School St. Estimated cost, $10,000.

Mass., West Springfield (Springfield P. O.)—The Smith-Springfield Body Co., Circuit Ave., has awarded the contract for the construction of a 1 story, 90 x 320 ft. addition to its automobile body plant, with an ell 30 x 110 ft. Estimated cost, $150,000.

R. I., Providence — D. Marandola, 1275 Pleasant St., plans to build a 1 story garage and service station on Hartford Ave. and Middleton St. Estimated cost, $20,000. Private plans.

MIDDLE ATLANTIC STATES

N. J., Newark—L. Capalone is having plans prepared for the construction of a 1 story garage on Elizabeth Ave. Estimated cost, $40,000. F. Grad, 245 Springfield Ave., Archt. and Engr.

N. J., Trenton Junction—The New Jersey Highway Dept., Broad St. Bank, Trenton, plans to build a large garage on Scotch Rd. near Trenton. T. J. Wasser, Broad St. Bank, Trenton, Engr.

N. Y., Buffalo—The Warner Jewelry Case Co., 648 Michigan Ave., plans to build a factory on Michigan Ave. Estimated cost, $75,000.

N. Y., New York (Borough of Brooklyn)—M. Kelly, c/o Seelig & Finkelstein, Archts. and Engrs., 44 Court St., is having plans prepared for the construction of a 2 story, 100 x 150 ft. garage on Kings Highway. Estimated cost, $120,000.

N. Y., New York (Borough of Brooklyn)—H. Kornbloom, 26 Court St., will build a story, 95 x 110 ft. garage on 40th St. Estimated cost, $50,000.

N. Y., New York (Borough of Brooklyn)—The Maylson Realty Co., c/o McCarthy & Kelly, Archts. and Engrs., 16 Court St., will alter its 1 story, 100 x 100 ft. garage at 218 Navy St. Estimated cost, $30,000.

N. Y., New York (Borough of Brooklyn)—The M. C. K. Constr. Co., 1438 Park Ave., will build a 1 story, 95 x 225 ft. garage on Meeker and Morgan Aves. Estimated cost, $125,000.

N. Y., New York (Borough of Manhattan)—G. R. and J. T. Smith, c/o N. J. Convery, Archt. and Engr., 767 Broad St., Newark, N. J., have awarded the contract for the construction of a 4 story garage on University Pl. and 12th St., here. Noted Feb. 17.

N. Y., New York (Borough of Manhattan)—H. I. Stitler Inc., 529 Washington St., has awarded the contract for the construction of a 2 story garage on Washington and Bethune Sts. Estimated cost, $250,000. Noted April 21.

Pa., Beaver Falls—The Traver Eng. Co. plans to build a 100 x 200 ft. addition to its plant, for the manufacture of special machinery. H. G. Traver, Pres.

SOUTHERN STATES

La., New Orleans — J. P. Sutton, 2001 Rousseau St., will rebuild his iron foundry on St. Andrew and Rousseau Sts. New building will be 1 story, 110 x 150 ft.

Va., Alexandria—The Bureau of Yards & Docks, Navy Dept., Wash., D. C., will soon award the contract for altering plating shop and cafeteria at the Naval Torpedo station here. Noted Feb. 24.

MIDDLE WEST STATES

Ill., Chicago — The Ludlow Typograph Co., 3032 Clybourne Ave., has awarded the contract for the construction of a 3 story, 50 x 120 ft. factory at 2040 Clybourne Ave., for the manufacture of type setting machinery. Estimated cost, $75,000.

Ill., Chicago—Whitney & Ford, 4325 Cottage Grove Ave., plan to install a machine shop to handle plumbing supplies on Western Ave. and 40th St.

Ind., Indianapolis — The Henry Furnace & Fdry. Co., 915 North Davidson St., plans to build a 2½ story storage and factory building to cover 25,000 sq.ft. of floor space. Estimated cost, $100,000.

Ind., Michigan City—The Weil McLain Co. plans to build a 1 story, 60 x 160 ft. metal pattern factory. Estimated cost, $50,000. Private plans.

Mich., Adrian — The Utility Compressor Co., 1161 East Harper Ave., Detroit, has had plans prepared for the construction of a 1 story, 73 x 240 ft. factory for the manufacture of iceless refrigerators. Estimated cost, $40,000. Baxter, O'Dell & Halpin, 1024 Hammond Bldg., Detroit, Archts.

Mich., Benton Harbor—C. C. Sweet will soon award the contract for the construction of a 1 story, 90 x 150 ft. garage. E. R. Austin, 31 J. M. S. Bldg., South Bend, Ind., Archt.

Mich., Detroit — F. J. Whitney, 5955 Grand River Ave., has awarded the contract for the construction of a 2 story, 100 x 190 ft. service station on Second and Cass Aves. Estimated cost, $100,000. Noted March 17.

Mich. Marysville—The Monarch Pattern Wks., 1426 Russell St., Detroit, plans to build a 2 story, 40 x 100 ft. pattern shop. Estimated cost, $40,000. Private plans.

O., Cleveland — A. J. Lukivinski, 7665 Bway., has awarded the contract for the construction of a 1 story, 60 x 130 ft. garage. Estimated cost, $40,000.

Wis., Manitowoc—H. Brandenburg, 1303 Washington St., is having plans prepared for the construction of a 1 story, 30 x 180 ft. garage, repair shop and sales room, on 13th and Washington Sts. Estimated cost, $75,000. H. V. Hertling, Dempsey Bldg., Archt.

Wis., Platteville—The Fiedler Motor Co. will soon award the contract for the construction of a 2 story, 100 x 136 ft. garage and office building on Water and Main Sts. Estimated cost, $75,000. E. C. Fiedler, Secy. H. Kleinhammer, Platteville, Archt. Noted May 5.

STATES WEST OF THE MISSISSIPPI

Mo., North Kansas City (Kansas City P. O.)—The Standard Steel Wks., 1722 Tracy St., Kansas City, has awarded the contract for the construction of a 1 and 2 story, 118 x 225 ft. factory and office building. Estimated cost, $75,000. Noted May 5.

Mo., Springfield—The Forster Mfg. Co. is having plans prepared for the construction of a 1 and 2 story canning factory. Estimated cost, $50,000.

WESTERN STATES

Cal., Bakersfield—The Natl. Supply Co. has purchased a 5 acre site here and plans to build machine shops and other buildings.

CANADA

Ont., Blenheim— T. W. Graham will soon award the contract for the construction of a 2 story, 35 x 70 ft. garage Estimated cost, $25,000.

Ont., Toronto — A. Clancy, c/o P. L. Davis, Archt., 157 Danforth Ave., will soon award the contract for the construction of a 2 story, 40 x 60 ft. garage on Danforth St. Estimated cost, $30,000.

FOREIGN

T. H., Pearl Harbor — The Bureau of Yards & Docks, Navy Dept., Wash., D. C., will receive bids until June 29 for footings for machine shop here.

General Manufacturing

NEW ENGLAND STATES

Conn., Essex — E. E. Dickenson & Co., manufacturer of witch hazel, has had plans prepared for the construction of a 2 story addition to its factory. Estimated cost, $40,000. Brown & Von Beren, 185 Church St., New Haven, Archts.

Mass., Newtonville—The Security Mills, Inc., West Newton, has awarded the contract for the construction of a textile mill including a 1 story, 75 x 250 ft. mill building, 1 story, 55 x 90 ft. dye-house and a 1 story, 30 x 35 ft. boiler house. Estimated cost, $125,000.

Mass. North Dighton — The Mt. Hope Finishing Co. has awarded the contract for the construction of a 1 and 4 story addition to its textile manufacturing plant and storage building, to cover 81,000 sq.ft. of floor space, on Spring St. Estimated cost, $250-000. Noted March 31.

Mass. South Weymouth (Boston P. O.)—The Stetson Shoe Co., Inc., will soon award the contract for the construction of a 4 story addition to its factory here. Estimated cost, $40,000. E. Nichols, 70 Kelly St., Boston Archt.

R. I. Arkwright (Fisherville P. O.)—The Interlaken Mills, Inc., has awarded the contract for the construction of a 1 and 2 story addition to its finishing plant and weave shed. Estimated cost, $125,000. Noted April 21.

MIDDLE ATLANTIC STATES

N. J., Newark—The New York Pie Co., 82 Sullivan St., New York City, will soon receive bids for the construction of a 3 story bakery here. Estimated cost, $200,-000. Ballinger Co., 47 West 34th St., New York City, Archt. and Engr.

N. J., Woodstown—The Woodstown Coal & Ice Co. plans to build a 2 story, 20 x 100 ft. addition to its cold storage plant. Estimated cost, $25,000. Private plans.